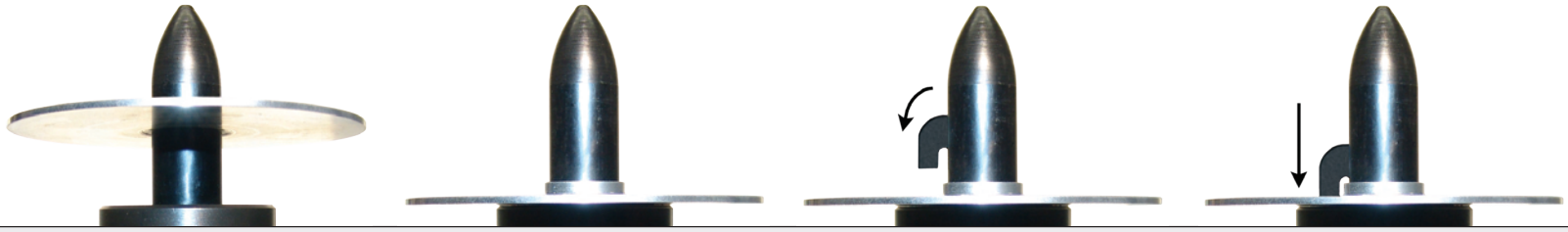
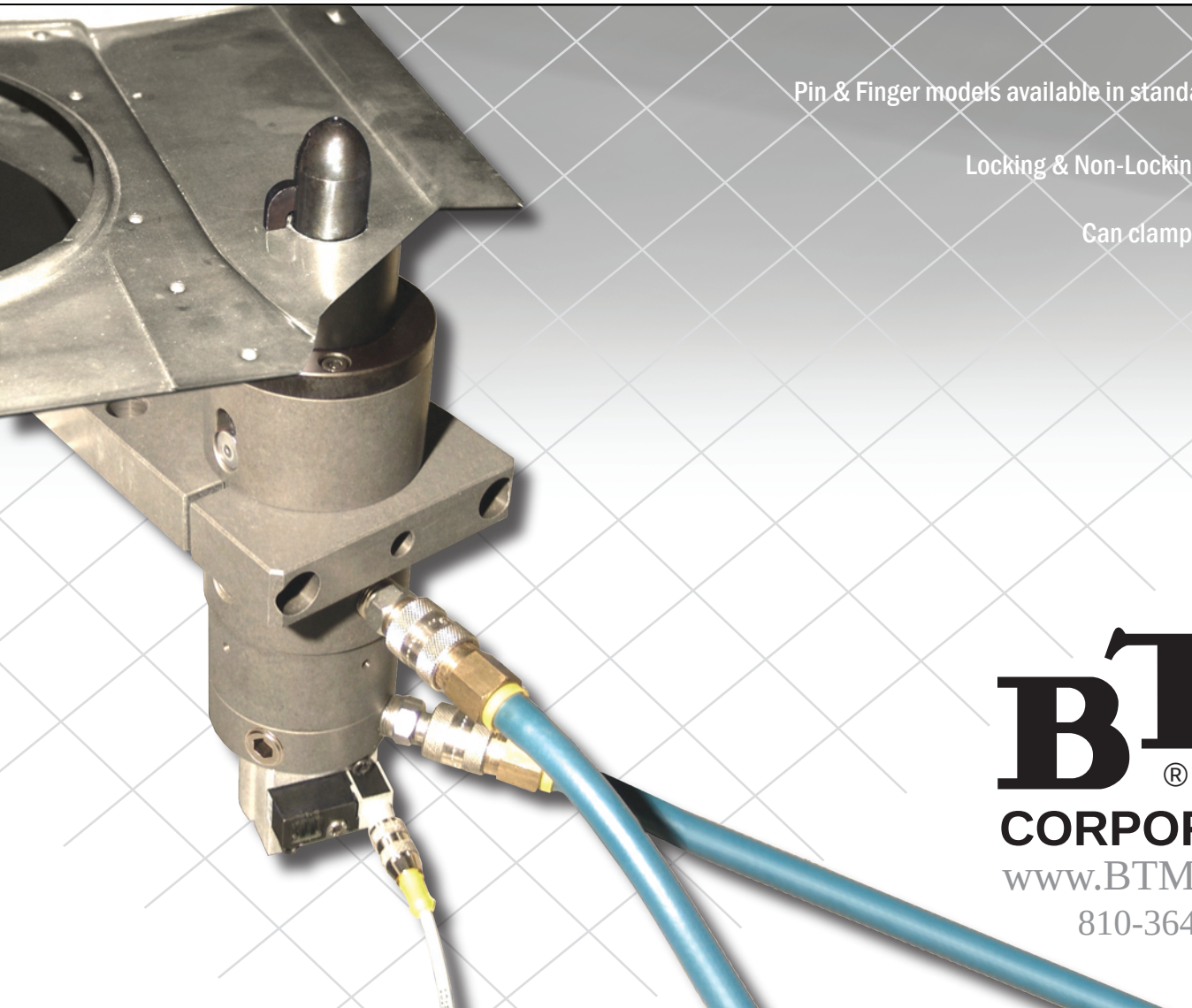
# User Guide: **Pin Locator Clamps**

*Featuring information on both locking and non-locking pin and finger models*





Pin & Finger models available in standard or special sizes

Locking & Non-Locking models available

Can clamp over flanged holes

BTM®
CORPORATION

www.BTMcorp.com
810-364-4567

# INTRODUCTION

**Safety Note:** Customer is responsible for the safe operation and use of the products shown in this literature.

## BEFORE YOU BEGIN

BTMs' Pin and Finger Clamps are designed to provide long service in a production environment. For safe operation and best results read this guide thoroughly before installing or servicing BTM clamps. For clamp application questions contact BTM's sales department at 810-364-4567. For service issues call our service pager at 810-340-3039 to leave a numeric message and we will return your call promptly.

## NON-LOCKING CLAMPS

### PLC-45
**PIN LOCATOR CLAMP**

| | |
|---|---|
| Hole/Slot Range | 12.80mm-16.00mm |
| Clamping Force | 578N @ 5.5BAR (130lbf @ 80PSI) |

**Features**

- Hardened pin Rc 58-62
- Pin diameter range: 12.8mm-16.00mm Ø
- Clamps on top of a flange.
- 360° mounting surface.
- 90° positive locating detents
- World switch package

### PLC-63
**PIN LOCATOR CLAMP**

| | |
|---|---|
| Hole/Slot Range | 19.80mm-40.00mm |
| Clamping Force | 1334N @ 5.5BAR (300lbf @ 80PSI) |

**Features**

- Hardened pin Rc 58-62
- Pin diameter range: 19.8mm-40.00mm Ø
- Finger relief for flanged hole clearance (25mm, 30mm, 40mm)
- 360° mounting surface
- 90° positive locating detents
- World switch package

### SFC-63
**SINGLE FINGER CLAMP**

| | |
|---|---|
| Hole/Slot Range | 18mm-40mm |
| Clamping Force | 1334N @ 5.5BAR (300lbf @ 80PSI) |

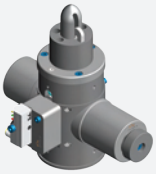
**Features**

- Hole or slot range: 18mm-40mm Ø
- Finger relief for flanged hole clearance
- 360° mounting surface.
- 90° positive locating detents
- World switch package

## LOCKING CLAMPS

### LPLC-38
**PIN LOCATOR CLAMP**

| | |
|---|---|
| Hole/Slot Range | 19.80mm-40.00mm |
| Clamping Force | 900 - 1334N @ 5.5BAR (200 - 300lbf @ 80PSI) |



**Features**

- Hardened pin Rc 58-62
- Pin diameter range: 18mm-40mm Ø
- Finger relief for flanged hole clearance (25mm, 30mm, 40mm)
- 360° mounting surface.
- 90° positive locating detents
- World switch package (front or rear pos.)

### LSFC-38
**PIN LOCATOR CLAMP**

| | |
|---|---|
| Hole/Slot Range | 18mm-40mm |
| Clamping Force | 900 - 1334N @ 5.5BAR (200 - 300lbf @ 80PSI) |

**Features**

- Hole or slot range: 18mm-40mm Ø
- Finger relief for flanged hole clearance
- 360° mounting surface.
- 90° positive locating detents
- World switch package (front or rear pos.)

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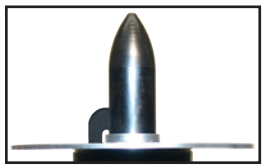
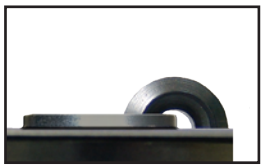
**WARNING!** - Always discronnect air and electrical supply lines before working on or around clamps.

## CLAMP SELECTION

Hole size determines pin clamp model.
Must the part be located and clamped or just clamped?

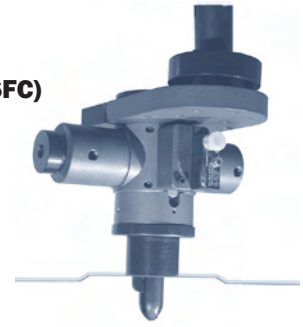




**SELECT A:** **Pin Locating Clamp (PLC)** or **Single Finger Clamp (SFC)**

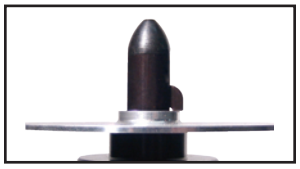
Must the part remain clamped when the air supply is removed?

Select a **Locking Pin Locating Clamp (LPLC)** or **Locking Single Finger Clamp (LSFC)**

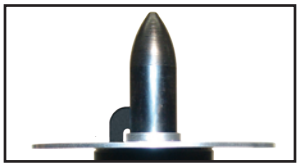


In cases involving an extruded (flanged) hole:

12-18mm = PLC45 Note: finger will clamp on top of hole flange (non-locking)

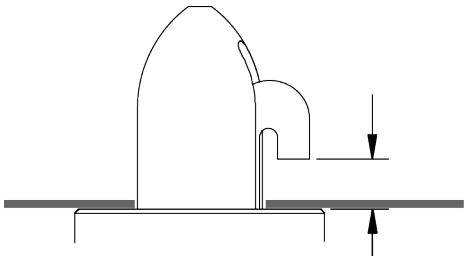


18-40mm = PLC63 Note: finger will clamp over hole flange (non-locking)
18-40mm = LPLC38 Note: finger will clamp over hole flange and lock

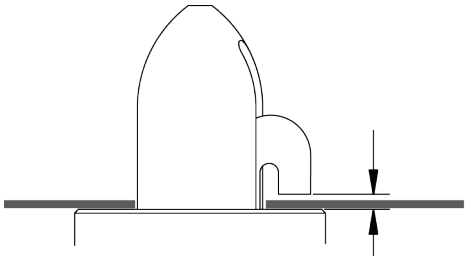


Consider the material thickness variation relative to the specified clamping and locking range for each size/type of Pin Clamp:

12-18mm = PLC45 Clamping range = 10mm from top of rest block (donut)
18-40mm = PLC63 Clamping range = 10mm from top of rest block (donut)
18-40mm = LPLC38 Clamping range = 3mm from top of rest block (donut)



10 mm Clamping Range to rest block surface *(allow for material)*

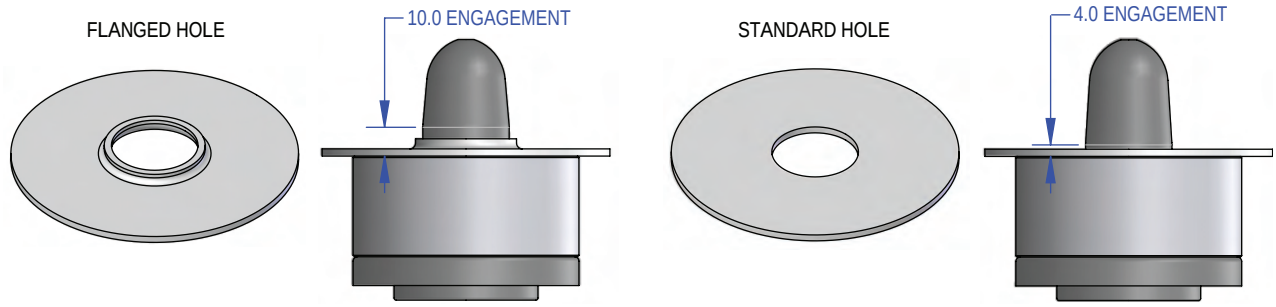


3 mm Clamping/Locking Range *(allow for material)*

Now that the type of clamp has been selected consider the pin and rest block (donut) requirements:

Try to select a standard pin configuration to keep the cost down.
However, when special pins and rest blocks (donuts) are required please consider the following:

Is the hole flanged* or standard?

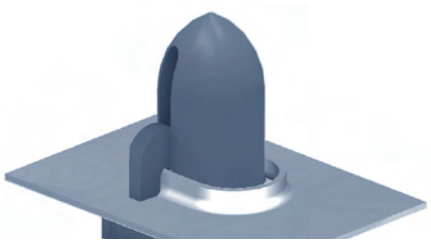



* Flanged pin option *only* available on 25-24.8, 30-29.8, and 40-39.8mm sizes

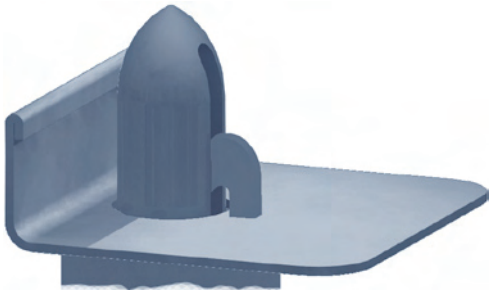
## DESIGN STEPS

Turn the clamp to locate the finger to:

Properly apply clamping force to the part while considering material thickness relative to clamping range starting at the top of the part.



Clear the flange (maximum flange height from top of part is 5.5mm)



Clear other part features

Avoid weld tooling or contamination

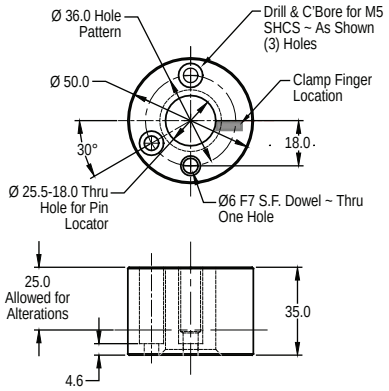
Design the shape of the pin and orient the pin shape to the pin's mounting hole pattern.

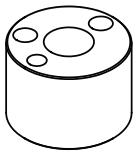
When designing your own rest block (donut), design the shape relative to the mounting hole pattern and the clamp finger location. (see pp 6-7)

## REST BLOCK (DONUT) ALTERATION

The donut (clamping surface) may be altered to suit specific applications. The donut may be removed, cut down or cut away to allow for work clearance or excessive material thickness. The standard donuts are made from 8620 and are carburized to Rockwell 'C' 58-62 to a case depth of 0.5mm-2.0mm [.02" to .08"]. When altering a donut, be sure to leave adequate clamping surface for the clamp finger to clamp against. If your clamp is non-standard, contact BTM for a drawing of your specific donut. When designing your own donut, design the shape relative to the mounting hole pattern and the clamp finger location.

### Standard Rest Block Dimensions for Pin Clamps With Pin Diameters: 25.5-18mm [PLC63 & LPLC38]

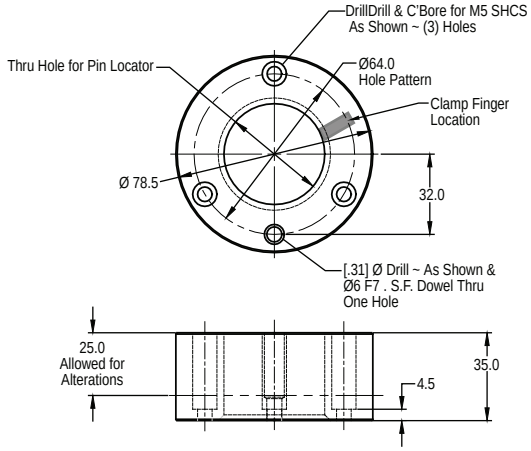


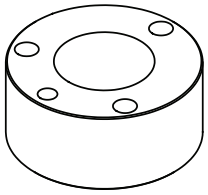



THE ALLOWABLE ALTERATION DIMENSION OF THE REST BLOCK (DONUT) DETAIL TO THE LEFT IS BASED ON A 35MM HIGH

Material: 8620
Hardness: R'c' 58-62 to a case depth of 0.5-2.0mm [.02-.08"]

### Standard Rest Block Dimensions for Pin Clamps With Pin Diameters: 42.0-25.0mm [PLC63 & LPLC38]

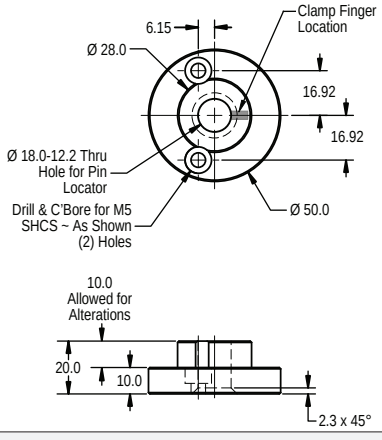

DrillDrill & C'Bore for M5 SHCS As Shown ~ (3) Holes
Thru Hole for Pin Locator
Ø64.0 Hole Pattern
Clamp Finger Location
Ø 78.5
32.0
[.31] Ø Drill ~ As Shown & Ø6 F7 . S.F. Dowel Thru One Hole
25.0 Allowed for Alterations
35.0
4.5

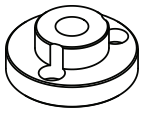


THE ALLOWABLE ALTERATION DIMENSION OF THE REST BLOCK (DONUT) DETAIL TO THE LEFT IS BASED ON A 35MM HIGH

Material: 8620
Hardness: R'c' 58-62 to a case depth of 0.5-2.0mm [.02-.08"]

### Standard Rest Block Dimensions for Pin Clamps With Pin Diameters: 18.0-12.5mm [PLC45]

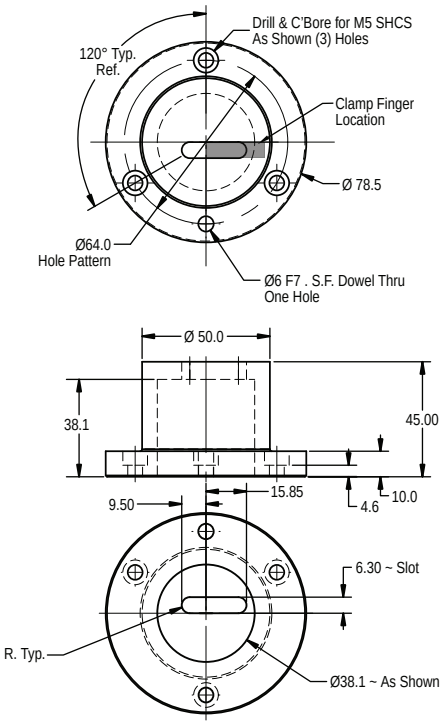


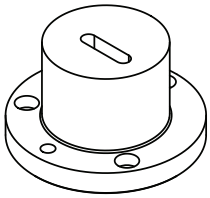



THE ALLOWABLE ALTERATION DIMENSION OF THE REST BLOCK (DONUT) DETAIL TO THE LEFT IS BASED ON A 20MM HIGH

Material: 8620
Hardness: R'c' 58-62 to a case depth of 0.5-2.0mm [.02-.08"]

## Standard Rest Block Dimensions for Finger Clamps With Pin Diameters: 29-18mm [SFC63 & LSFC38]

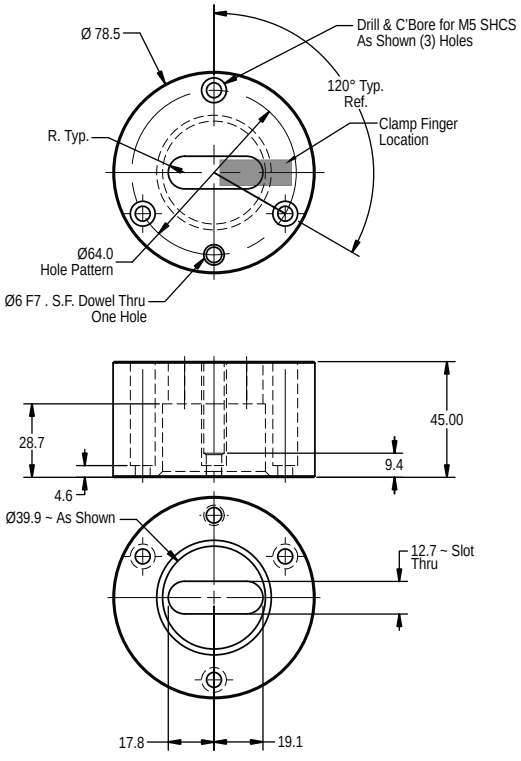


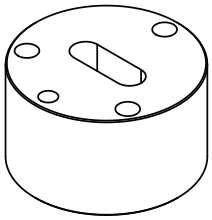



WHEN ALTERING TAKE NOTE OF CLEARANCE POCKET IN THE BOTTOM OF THE REST BLOCK (DONUT).

Material: 8620
Hardness: R'c' 58-62 to a case depth of 0.5-2.0mm [.02-.08"]

## Standard Rest Block Dimensions for Finger Clamps With Pin Diameters: 40-30mm [SFC63 & LSFC38]



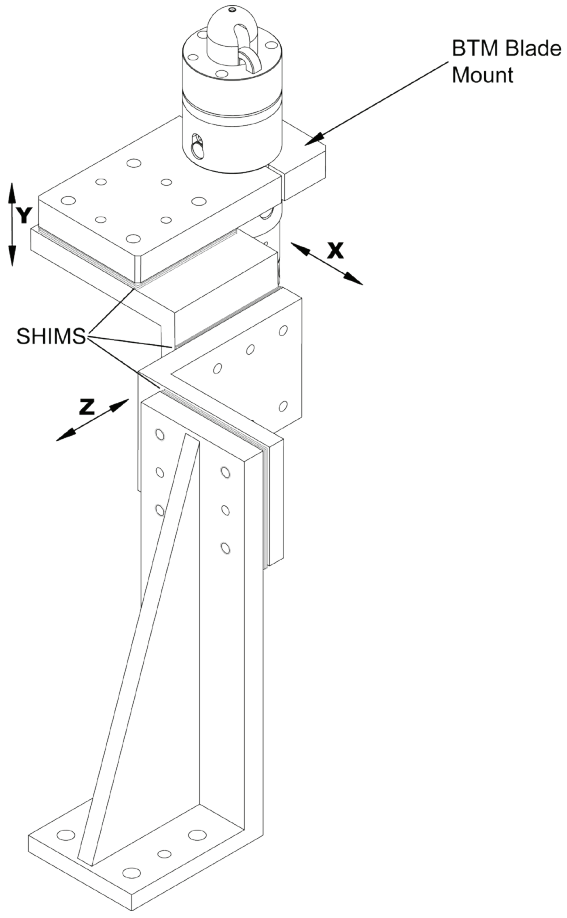
WHEN ALTERING TAKE NOTE OF CLEARANCE POCKET IN THE BOTTOM OF THE REST BLOCK (DONUT).

Material: 8620
Hardness: R'c' 58-62 to a case depth of 0.5-2.0mm [.02-.08"]

## MOUNTING

Consider X, Y, and Z pin adjustment.

Adjust the pin depth by shimming blade mount or machining the rest block.



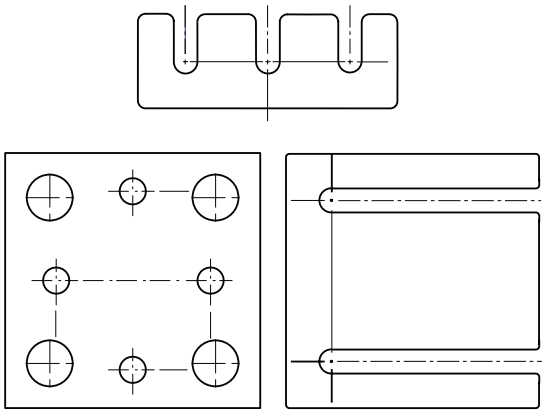

GLOBAL STANDARD COMPONENTS

TM NAAMS

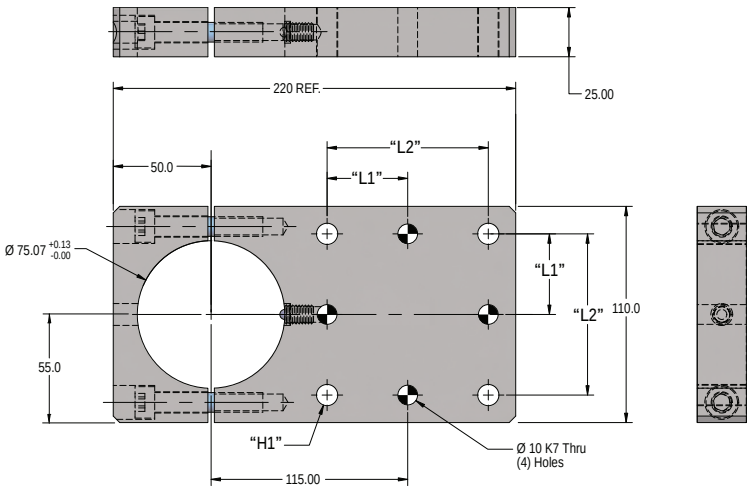
Assembly

BTM Blade Mounts with NAAMS mounting patterns are compatible with NAAMS shims as defined in the following specifications:

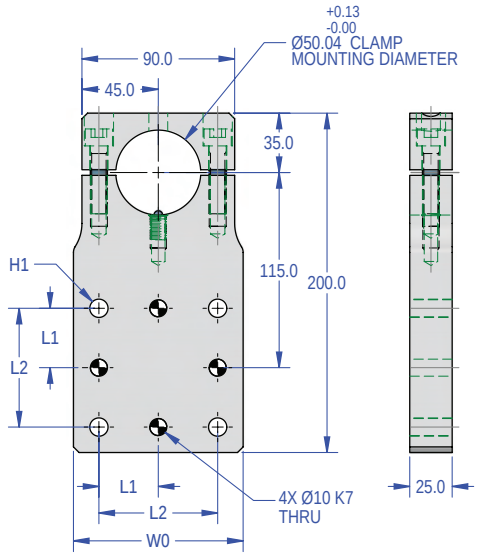
| Spec Name | Description | Numbers |
|---|---|---|
| NAAMS J-10 | Construction Spacer 3-Slot | ACSxxxS |
| NAAMS J-11 | Spacer for 70x70 Mounting | ACSxxx |
| NAAMS J-13 | Construction Shim 2-Slot | ACHxxx |

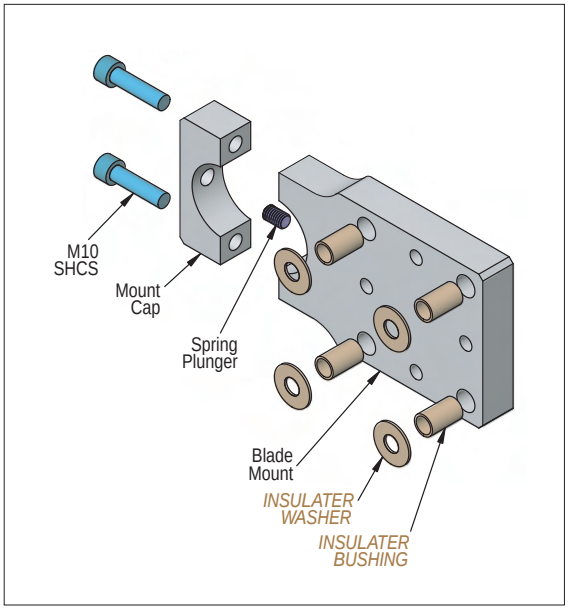


## BLADE MOUNT [PLC63, SFC63, LPLC38, & LSFC38]




| BTM Part Number | Mount Type | Ø H1 Thru (4) Holes | L1 | L2 |
|---|---|---|---|---|
| 794100A | Insulated C-Flex Mount | 12.0 Insulator Bushing | 41.00 | 82.00 |
| 794100B | C-Flex Mount | 12.1 | 41.00 | 82.00 |
| 794100C | Insulated NAAMS Mount | 10.0 Insulator Bushing | 35.00 | 70.00 |
| 794100D | NAAMS Mount | 10.8 | 35.00 | 70.00 |



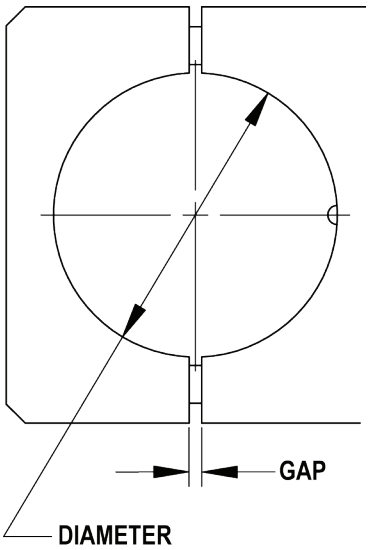

| BTM Part Number | Mount Type | Ø H1 Thru (4) Holes | W0 | L0 | L1 | L2 |
|---|---|---|---|---|---|---|
| 794400A | Insulated C-Flex Mount | 12.0 Insulater Bushing | 110.0 | 205.0 | 41.00 | 82.00 |
| 794400B | C-Flex Mount | 12.1 | 110.0 | 205.0 | 41.00 | 82.00 |
| 794400C | Insulated NAAMS Mount | 10.0 Insulater Bushing | 100.0 | 200.0 | 35.00 | 70.00 |
| 794400D | NAAMS Mount | 10.8 | 100.0 | 200.0 | 35.00 | 70.00 |

Insulated mounts are used in welding applications. Insulated mounts come with insulating washers and insulating bushings in the screw holes.

***Note: It is the customer's responsibility to insulate any dowels required for mounting.***

## DESIGNING YOUR OWN MOUNT

When designing your own mount, it is critical to adhere to the configuration shown in the illustration below.




| Clamp Size | Diameter |
|---|---|
| PLC-45 | Ø 50.04 +0.13 -0.00 |
| PLC-63, SFC-63, LPLC38, LSFC38 | Ø 75.07 +0.13 -0.00 |

### MOUNT SCREW TORQUE

Torque blade mount screws to 45.4N-m (33.5ft-lbs)

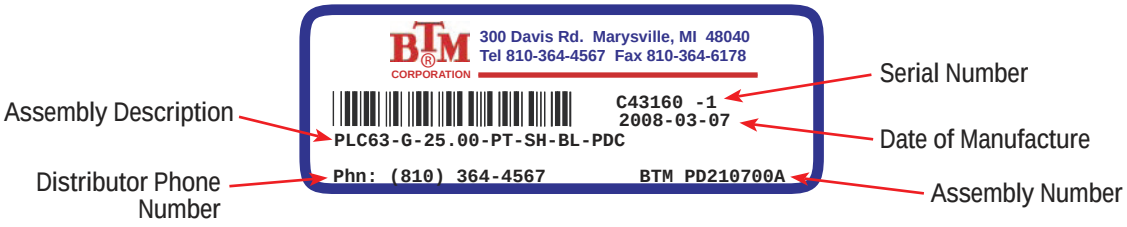
***Do not over torque.***
***May cause cylinder distortion***

## IDENTIFICATION OF YOUR CLAMP

**NOTE: BTM implemented a new numbering system for its pin and finger clamps in 2006. In 2007, BTM added tapered pin styles, standard or flanged hole pin options, and optional chrome pin coating.**

It is recommended to identify and record the model numbers before performing any service. A label is affixed to each clamp prior to shipment which lists the model and serial numbers.

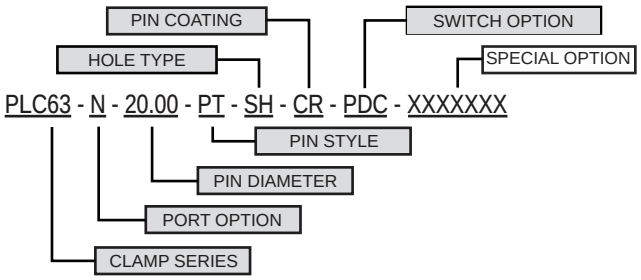
**This label information must be used when reordering spare parts or complete pin clamps.**



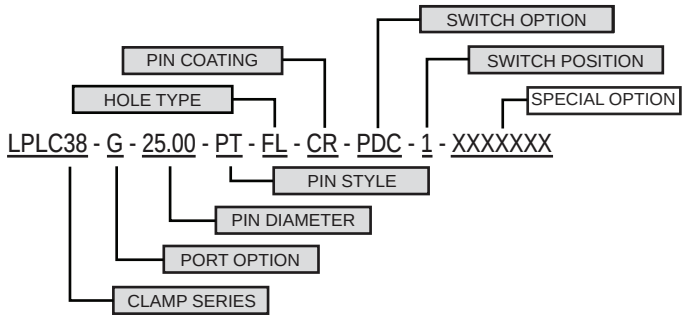

## CLAMP ASSEMBLY DESCRIPTION BREAKDOWNS

### TAPERED PINS

**PLC45 & PLC63**

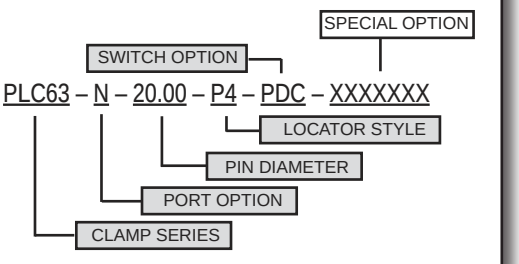



**LPLC38**

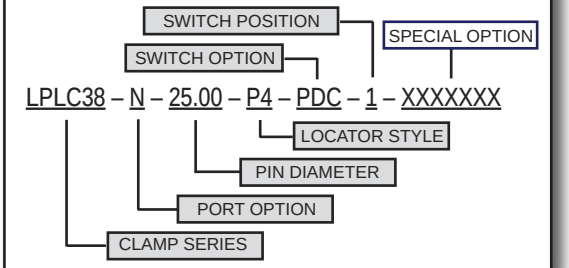



### STRAIGHT PINS

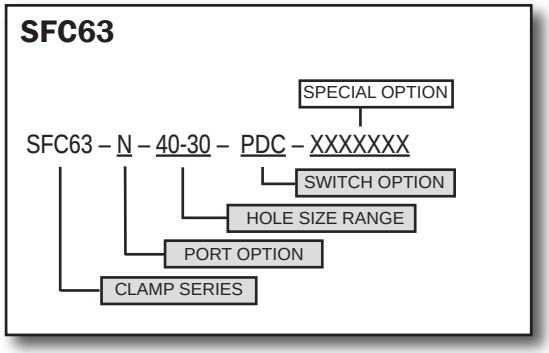
**PLC45 & PLC63**

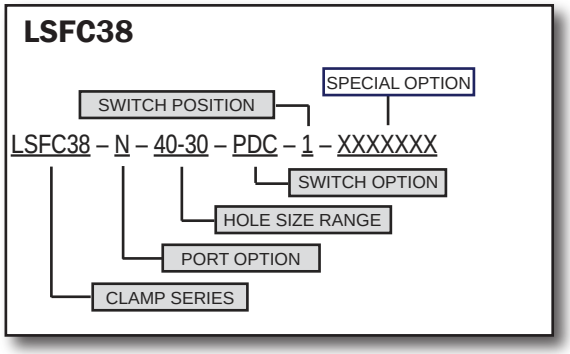



**LPLC38**

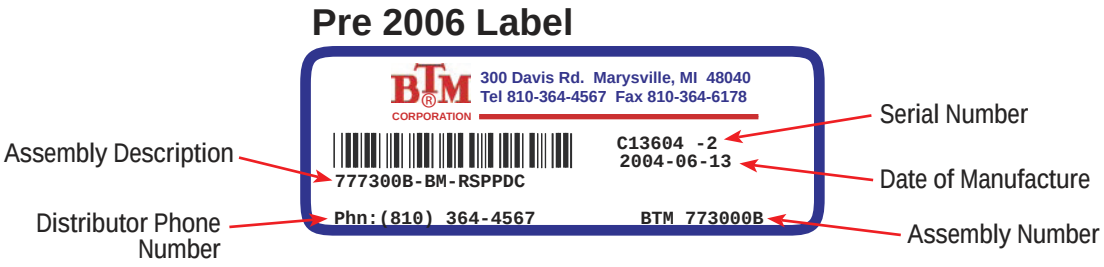


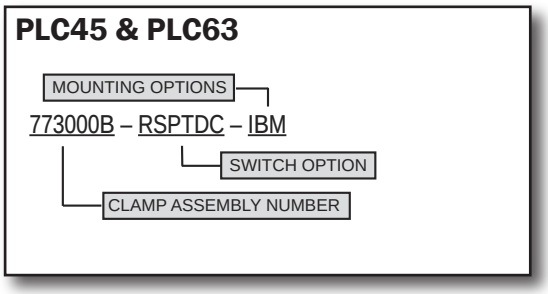
## SINGLE FINGER CLAMPS

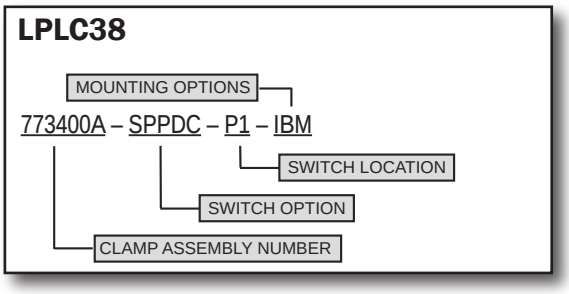



**Clamps built prior to 2006 will have the following label configuration:**




## AIR SUPPLY

Recommended operating air pressure is 80PSI (5.5 BARs).

**PORT INFORMATION:**

**PLC63 & SFC63 Clamps:** 3/8 NPT or G1/4
**PLC 45, LPLC38 & LSFC38 Clamps:** 1/8NPTF or G1/8

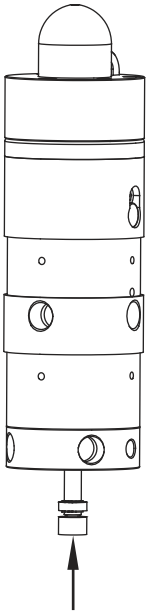
All clamps are lubricated for the life of the unit at the factory. Clean dry air is required for operation. In-line lubrication is not required but may be used.
*Note: Once lubricated air is used, it must continue to be used for the life of the clamp.*

## MANUALLY OPENING CLAMPS

### NON-LOCKING CLAMPS

WARNING! Make sure the air supply is disconnected!

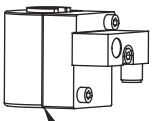
To manually open the PLC and SFC clamps, remove the rear switch package and push the end of the piston rod to open the clamp. Pulling on the rod will manually close the clamp.



PUSH TO MANUALLY OPEN CLAMP

### NON-LOCKING CLAMPS

Removal of the rear switch package is done by first removing the connector cord. Next, remove one 5mm S.H.C.S. located at the back of the switch package (4mm allen wrench required).



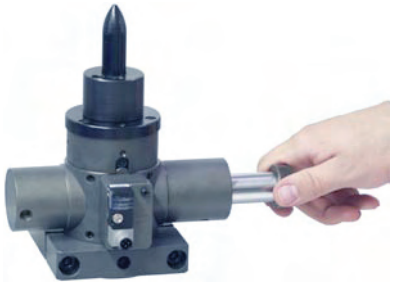
REMOVE SWITCH PACKAGE

REMOVE M5 SHCS *(4MM ALLEN WRENCH REQUIRED)*

### LOCKING CLAMPS

WARNING! Make sure the air supply is disconnected!

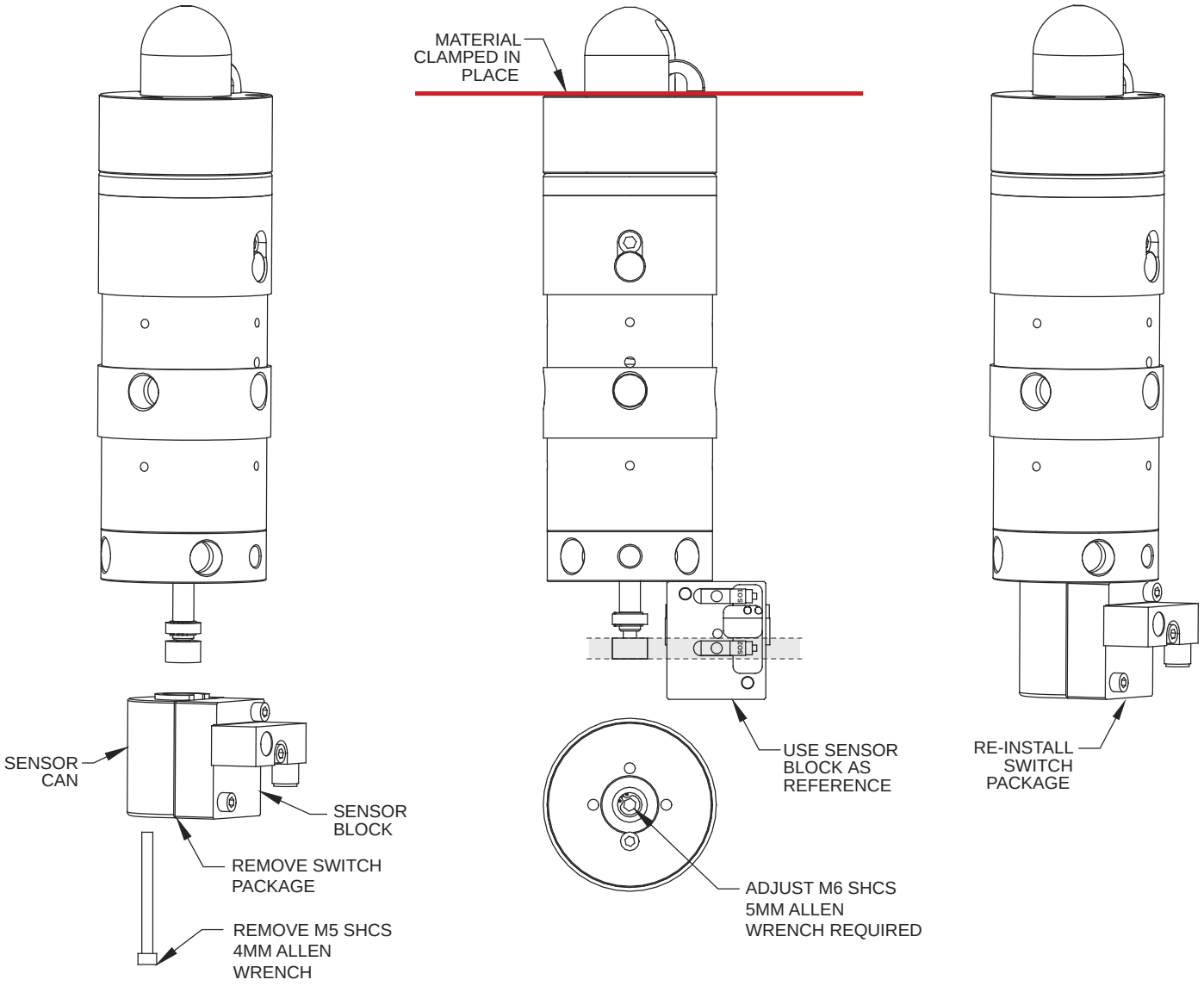
To manually unlock and open the LPLC and LSFC clamps, pull the unlock rod. Pushing the rod manually closes and locks the clamp.



## ADJUSTING REAR SENSING FLAG

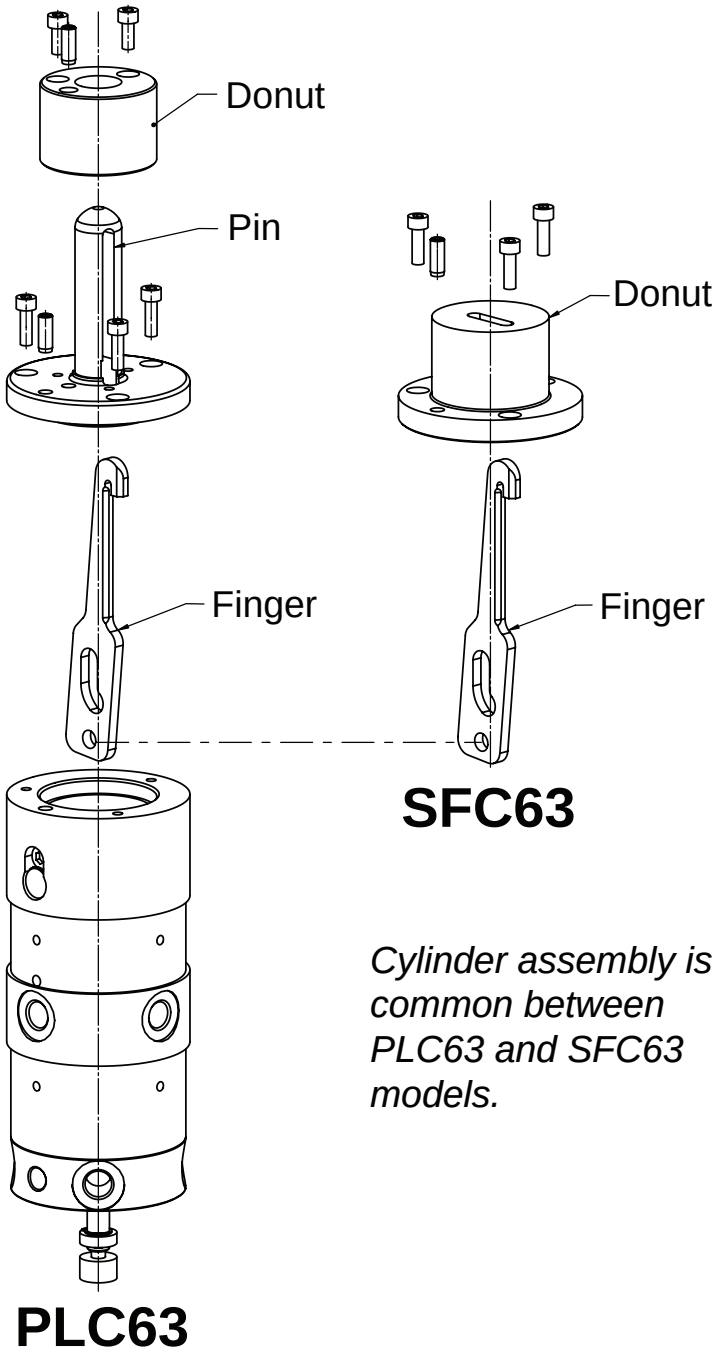
### NON-LOCKING CLAMPS ONLY

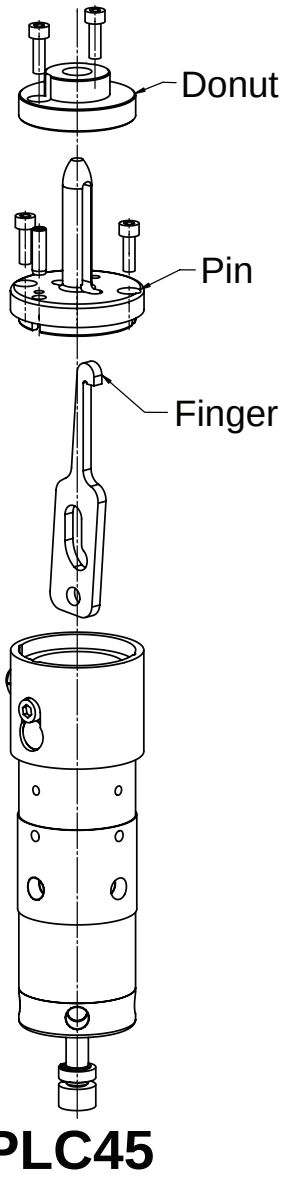
The rear sensing flag should be properly adjusted to match the thickness of the material being clamped. To adjust the rear flag, you must first remove the rear switch package. Remove the two screws holding the sensor block to the sensor can and remove the block. Use the sensor block as a reference for adjusting the rear flag (see below). With the appropriate material thickness clamped in place, adjust the 6mm S.H.C.S. enclosed in the rear flag so the flag is in line with the closed position sensor head (a 5mm allen wrench is required). Re-assemble and replace the switch package. Check for proper sensing.


MATERIAL CLAMPED IN PLACE
SENSOR CAN
SENSOR BLOCK
REMOVE SWITCH PACKAGE
REMOVE M5 SHCS 4MM ALLEN WRENCH
USE SENSOR BLOCK AS REFERENCE
ADJUST M6 SHCS 5MM ALLEN WRENCH REQUIRED
RE-INSTALL SWITCH PACKAGE

## MAIN COMPONENT IDENTIFICATION

### NON-LOCKING CLAMPS

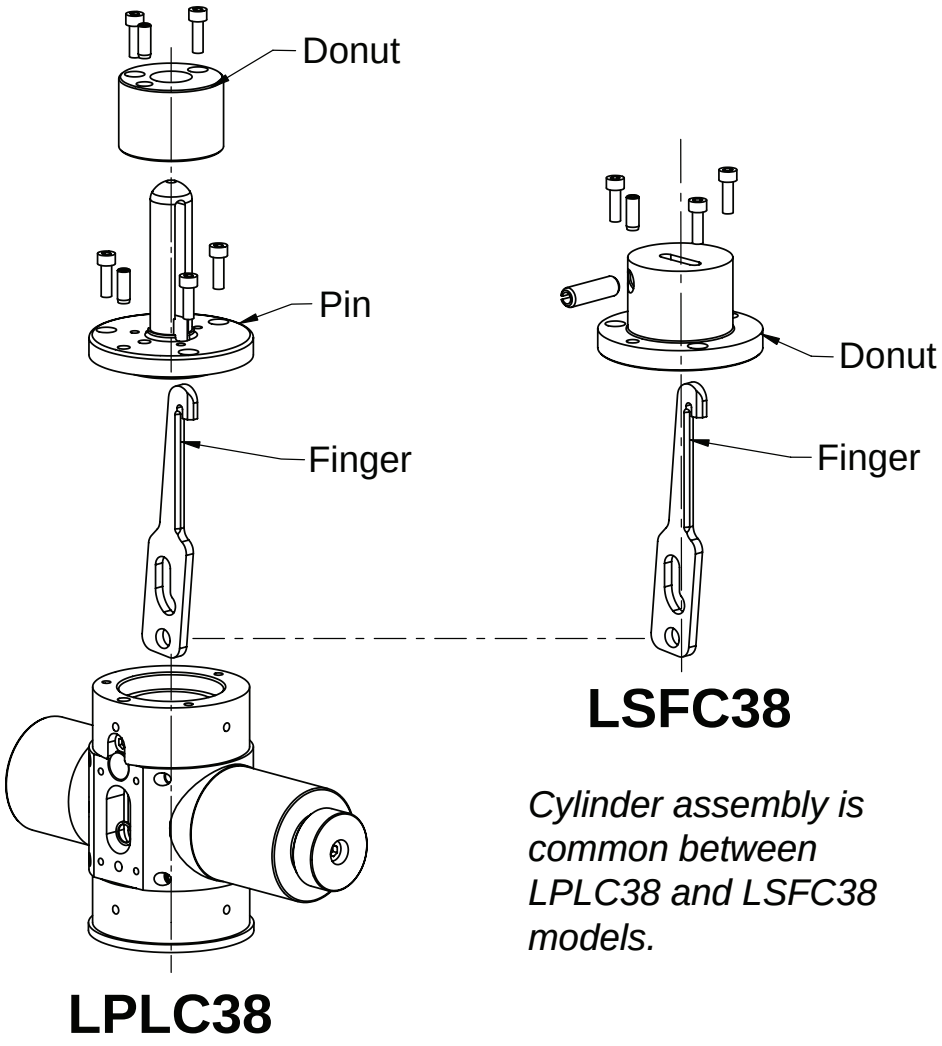



There are (3) main components that may be replaced or altered in PLC and LPLC clamps. They are the Pin, the Finger, and the Rest block (donut). In SFC and LSFC clamps, there are (2) main components which may be replaced; the Finger and the Rest block (donut). With PLC's, the Rest block (donut) is matched with a pin diameter, so if the pin diameter changes, the rest block (donut) will automatically have to be changed also. The fingers typically work in a range of pin diameters, so it may not be necessary to always replace a finger if the pin diameter changes.

## MAIN COMPONENT IDENTIFICATION

### LOCKING CLAMPS




*Cylinder assembly is common between LPLC38 and LSFC38 models.*

## DISASSEMBLING MAIN COMPONENTS

### PLC 63

If the clamp still has air pressure, cycle the clamp so that the finger is retracted inside of the pin.
**** If the clamp does not have air pressure, you will need to remove the switch package to manually retract the finger. Please refer to p.12 for directions on this procedure. ****

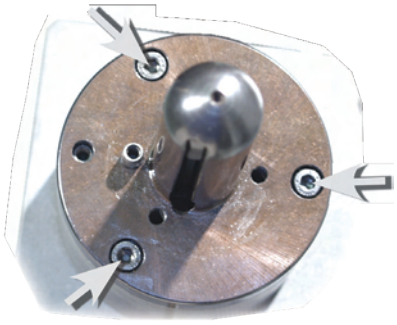
**CAUTION: Before removing any components, disconnect the Air & Electrical Supply from the pin clamp. Failure to do this could result in injury.**

**18-25mm Pins** **26-40mm Pins**

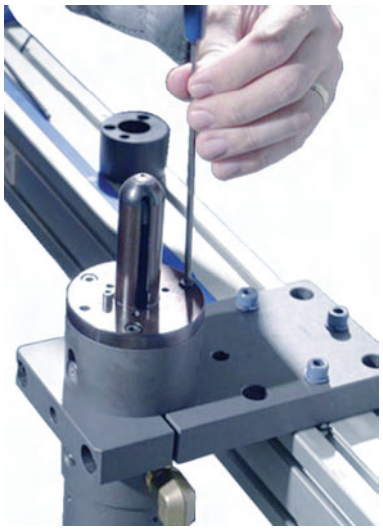
The rest block (donut) is secured to the locating pin by M5 socket head cap screws and an alignment dowel. *18-25mm pin clamps have (2) screws, 26-40mm pin clamps have (3) screws.*

Remove the mounting screws from the top of the rest block (donut) using a 4mm allen wrench.

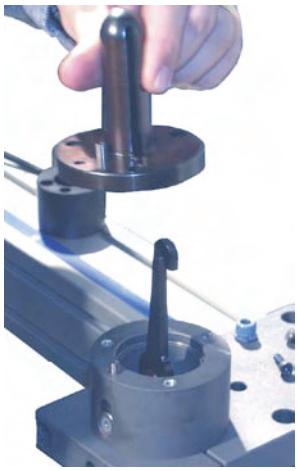
Once the screws have been removed, disengage the rest block (donut) from the alignment dowel and pull it off the pin.



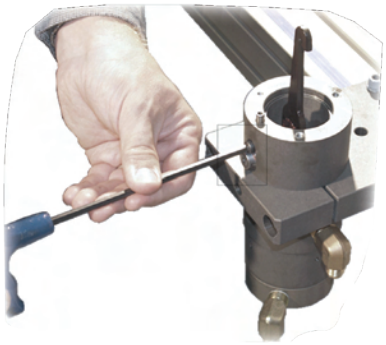
The locating pin is secured to the clamp housing by (3) M5 socket head cap screws and an alignment dowel located at the base of the pin.



Remove the three mounting screws using a 4mm allen wrench.

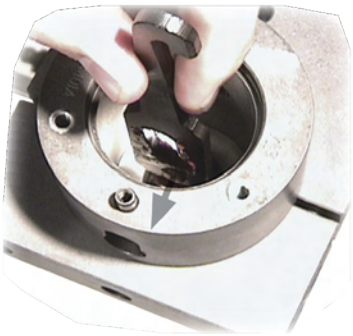


Disengage the locating pin from the alignment dowel and pull it straight up to clear the finger and remove it from the housing of the clamp.



Remove the retaining screw located above the cam pin. A 5mm allen wrench is required. The head of the retaining screw will act as a jack to help remove the cam pin from the clamp housing.

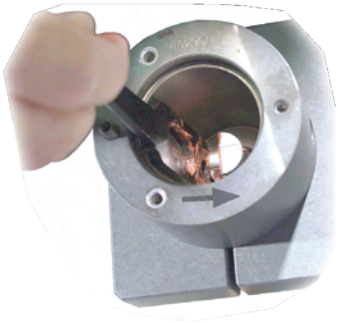
Pull the cam pin straight out to remove it.

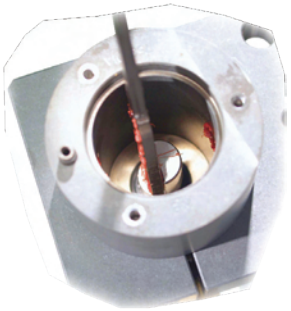


Slide the finger off of the drive pin and out of the clamp.

## RE-ASSEMBLING MAIN COMPONENTS

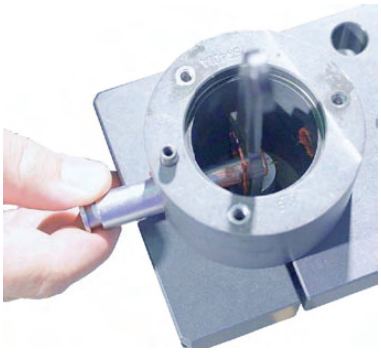
Make sure that the finger and the drive pin are properly greased.



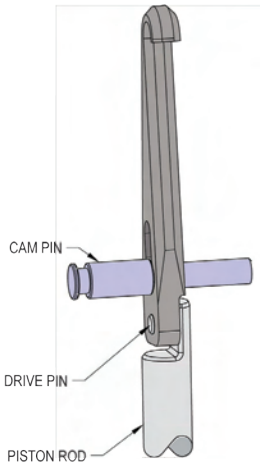


Slide the finger onto the drive pin on the piston rod of the clamp.

Make sure that the cam pin is properly greased.



Slide the camp pin into the cam pin hole and through the cam slot in the finger.




The finger must be trapped between the piston rod and the shoulder of the cam pin.

Insert the guide screw above the cam pin. Make sure that the head of the screw falls into the groove on the head of the cam pin. Tightening the screw will draw the cam pin into place.

Install the pin over the finger. Be sure to align the dowel pin in the clamp body with the dowel hole in the pin flange.

It may be necessary to use a brass hammer, or a rubbet mallet to gently tap the pin so it is seated properly.

Replace the (3) screws and torque them to 85 in-lbs.

Install the rest block (donut) over the pin. Be sure to align the dowel pin in the finger flange with the dowel hole in rest block (donut).

Replace the (2) or (3) screws [depending on the size] and torque them to 85 in-lbs.

## DISASSEMBLING MAIN COMPONENTS

### SFC 63

To disassemble the SFC63, follow the same procedure as for the PLC63. The only difference is that there is no locating pin to remove. The rest block (donut) of the SFC63 is mounted using the same screw holes and alignment dowel as the PLC63 Locating Pin.

## DISASSEMBLING MAIN COMPONENTS

### PLC 45

Disassembling the PLC45 is virtually the same as disassembling the PLC63, with a few minor exceptions as noted below. For any steps that are not clear, reference the disassembly procedure for the PLC63 in the previous pages.

The rest block (donut) is fastened to the pin flange with (2) SHCS. They are removed with a 4mm allen wrench.

There is no alignment dowel between the rest block (donut) and the pin.

The pin is fastened to the clamp housing with (2) SHCS and an alignment dowel. Remove the screws with a 4mm allen wrench. Disengage the pin flange from the dowel and remove the pin.

Remove the Cam Pin Screw using a 5mm allen wrench.

With the retaining screw removed, the cam pin can be pushed out from the opposite end.

## RE-ASSEMBLING MAIN COMPONENTS

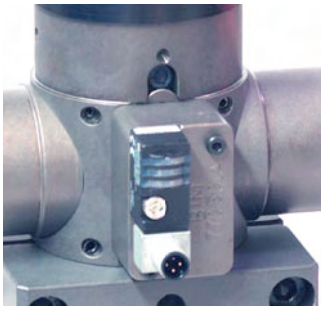
Make sure that the drive pin, cam pin, and finger are properly greased. Re-assemble the components using the procedure for the PLC63, adhering to the exceptions noted above.

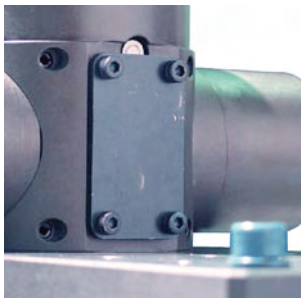
## DISASSEMBLING MAIN COMPONENTS

### LPLC 38

If the clamp still has air pressure, cycle the clamp so that the finger is retracted inside of the pin.
**** If the clamp does not have air pressure, you will need to manually retract the finger. Please refer to p.12 for directions on this procedure. ****

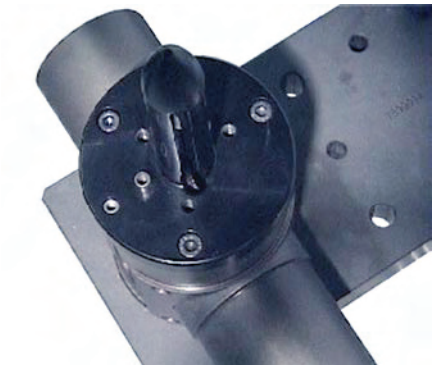
**CAUTION: Before removing any components, disconnect the Air & Electrical Supply from the pin clamp. Failure to do this could result in injury.**





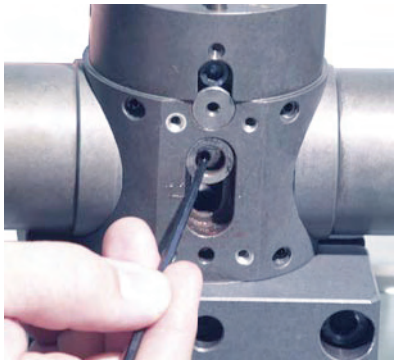
Remove the switch package and the cover plate using a 3mm allen wrench.

The rest black (donut) is secured to the location pin by M5 socket head cap screws and an alignment dowel. 18-25mm pin clamps have (2) screws, 26-40mm pin clamps have (3) screws. Remove the rest block (donut) screws with a 4mm allen wrench.

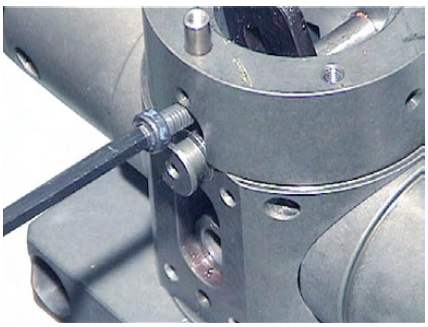


The locating pin is secured to the clamp housing by (3) M5 socket head cap screws and an alignment dowel located at the base of the pin. Remove the three mounting screws using a 4mm allen wrench. Disengage the locating pin from the alignment dowel and pull it striaght up to clear the finger and remove it from the housing of the clamp.

Remove the snap ring from one end of the drive pin.



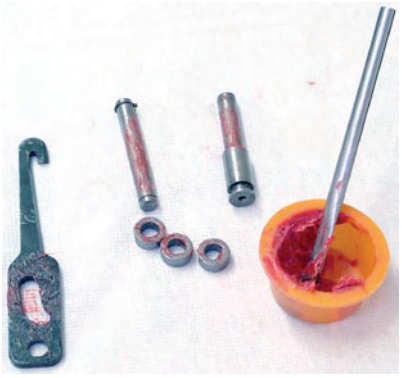
Push the drive pin through the rollers and remove it from the opposite side of the clamp.



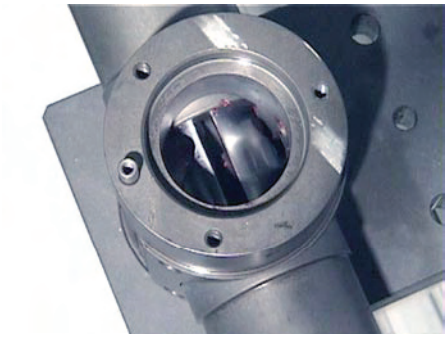
Remove the retaining screw located above the cam pin. A 5mm allen wrench is required. The head of the retaining screw will act as a jack to help remove the cam pin from the clamp housing.

Pull the cam pin straight out to remove it. Pull the clamp finger straight up to remove it from the piston slot.

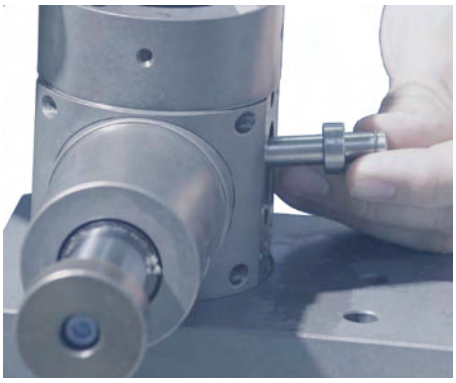
The center roller can only be accessed through the top of the clamp. Rotate the piston rod to orient the cam slot to access the center roller.



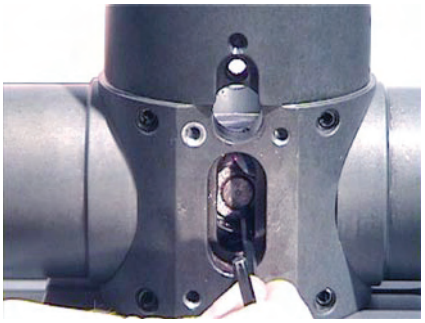
Before re-assembly, make sure that the clamp finger, cam pin, drive pin and all three rollers are properly greased.



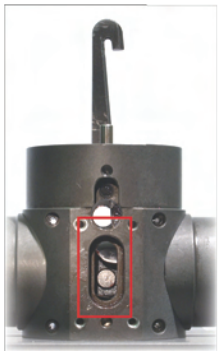
Install one roller into the cam slot in the piston. Orient the piston so the roller is perpendicular to the drive pin hole and the finger slot is facing up.



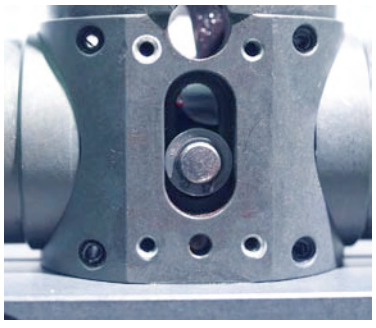
Install one roller onto the drive pin. Insert the drive pin until it engages the center roller.



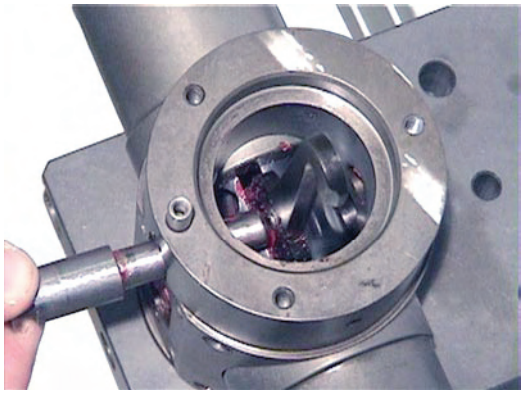
Hold the roller in place while the pin is inserted.



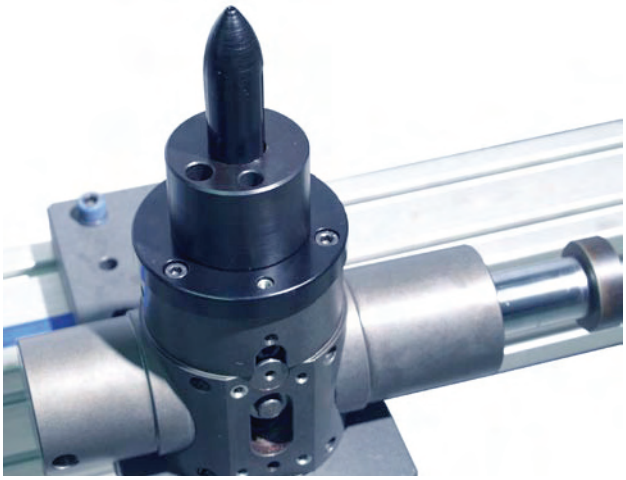
Install the finger so the drive pin hole lines up with the drive pin. Finish installing the drive pin.



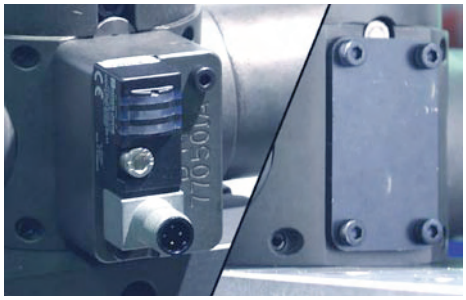
Install the final roller and replace the snap ring.



Insert the camp pin through the cam slot in the finger. Install the cam pin screw.



Install the pin over the finger. Be sure to align the dowel pin in the clamp body with the dowel hole in the pin flange. Replace the (3) screws and torque them to 85 in-lbs. Install the rest block (donut) over the pin. Be sure to align the dowel pin in the finger flange with the dowel hole in rest block (donut). Replace the (2) or (3) screws [depending on the size] and torque them to 85 in-lbs.



Replace the switch package and cover plate.

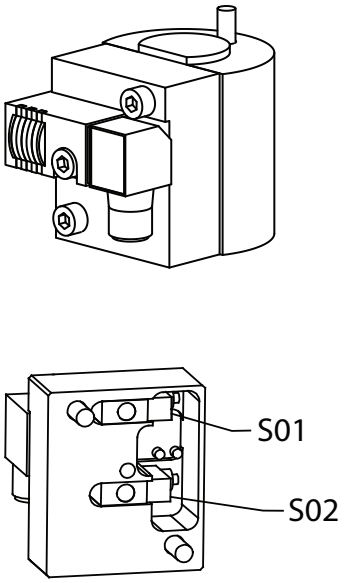
## DISASSEMBLING MAIN COMPONENTS

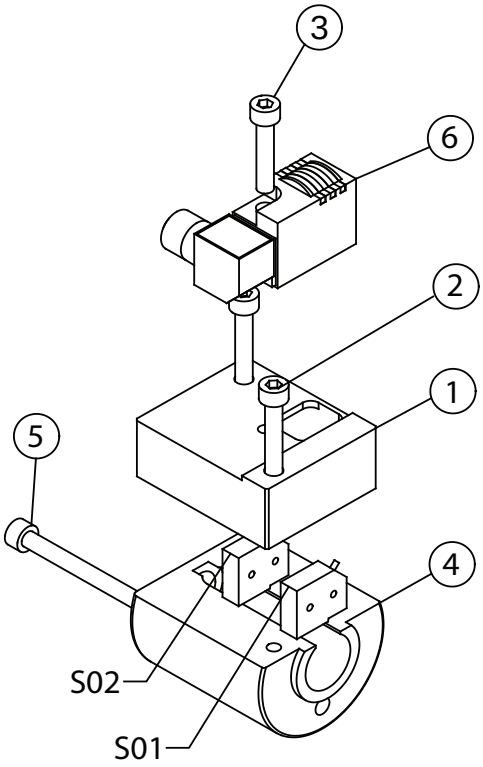
### LSFC 38

To disassemble the LSFC38, follow the same procedure as for the LPLC38. The only difference is that there is no locating pin to remove. The rest block (donut) of the LSFC38 is mounted using the same screw holes and alignment dowel as the LPLC38 Locating Pin.

## PROXIMITY SWITCH PACKAGES

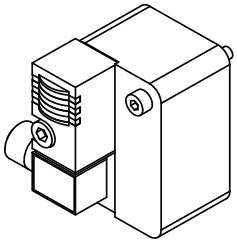
### NON-LOCKING CLAMPS (PLC 63, PLC 45, SFC 63)

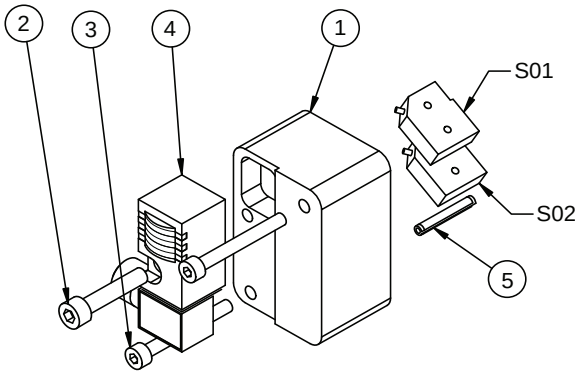


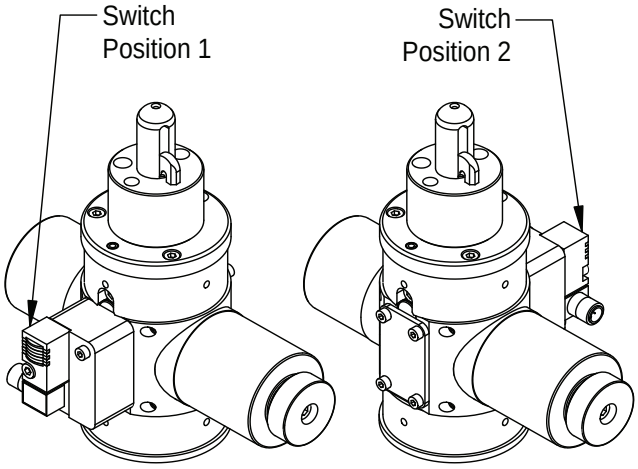




| Det | Qty | Description | BTM No. |
|---|---|---|---|
| 1 | 1 | Sensor Block | 753701A |
| 2 | 2 | M5 x 30 SHCS | 016452 |
| 3 | 1 | M5 x 25 SHCS | 015493 |
| 4 | 1 | Sensor Can | 744303A |
| 5 | 1 | M5 x 55 SHCS | 018495 |
| 6 | 1 | P+F DC Status Controller Switch | 020486 |

### LOCKING CLAMPS (LPLC 38 & LSFC 38)



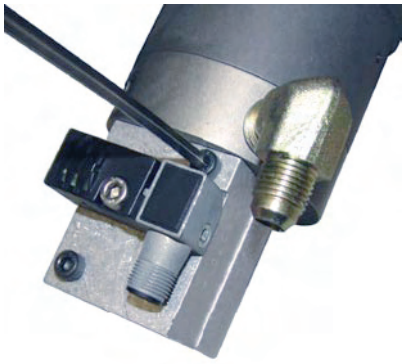



| Det | Qty | Description | BTM No. |
|---|---|---|---|
| 1 | 1 | Sensor Block | 770501A |
| 2 | 1 | SHCS: M5X0.8 X 25 | 015493 |
| 3 | 2 | SHCS: M4X0.7 X 35 | 018486 |
| 4 | 1 | P+F DC Status Controller Switch | 020486 |
| 5 | 1 | M5 x 55 SHCS | 019924 |

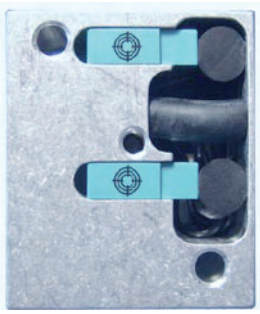
## CHANGING PROXIMITY SWITCHES

### NON-LOCKING CLAMPS ONLY



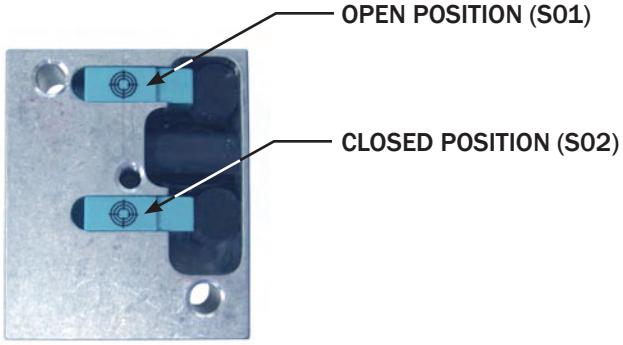
Remove the shielded electrical cable from the connector on the switch. Remove the the two screws which retain the sensor block to the sensor can remove the block.

Remove the screw which retains the switch to the sensor block.



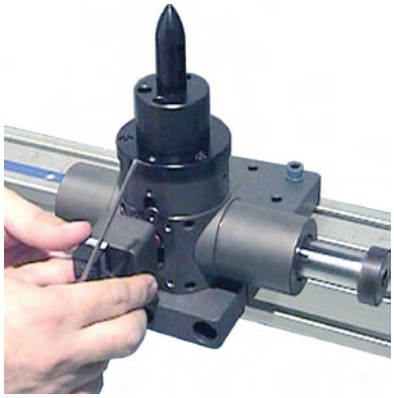
Remove the rubber retainers and remove the sensor heads from the block. Sensor heads are retained by a slip fit.

Pass the sensor heads through the clearance hole in the sensor block to remove the switch.




Reverse the procedure to install the new switch, adhering to the configuration shown above. Note that the sensor head (S02) is mounted to sense the clamp in the closed and clamped position.

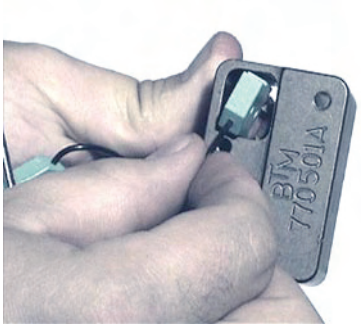
## LOCKING CLAMPS ONLY



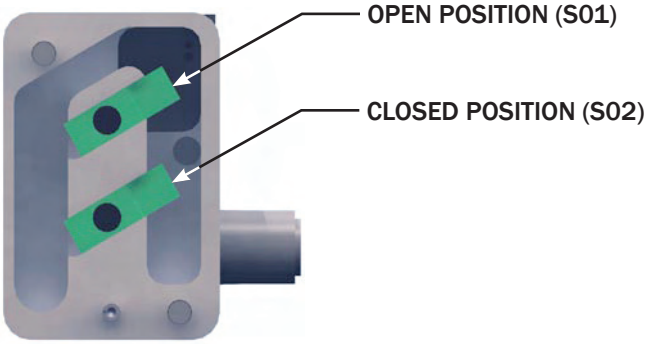
Remove the shielded electrical cable from the connector on the switch. Remove the two screws which retain the sensor block to the clamp body and remove the block.

Remove the screw which retains the switch to the sensor block.

Remove the rubber retainers and remove the sensor heads from the block. Sensor heads are retained by a slip fit.



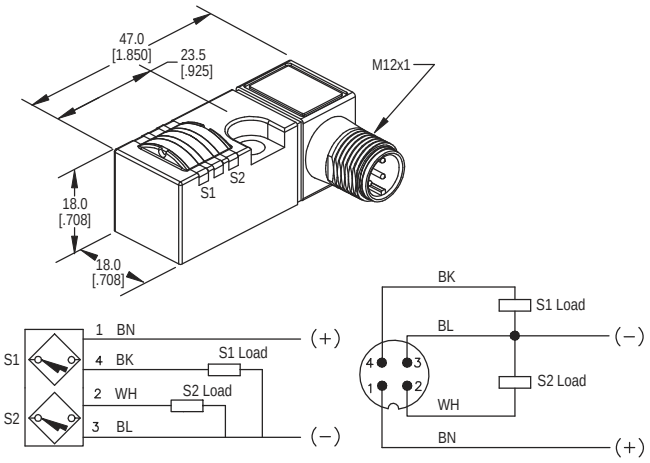

Pass the sensor heads through the clearance hole in the sensor block to remove the switch.



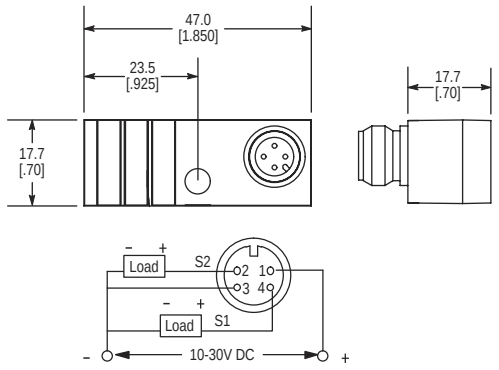

Reverse the procedure to install the new switch, adhering to the configuration shown above. Note that the sensor head (S02) is mounted to sense the clamp in the closed and clamped position.

## PROXIMITY SWITCH INFORMATION

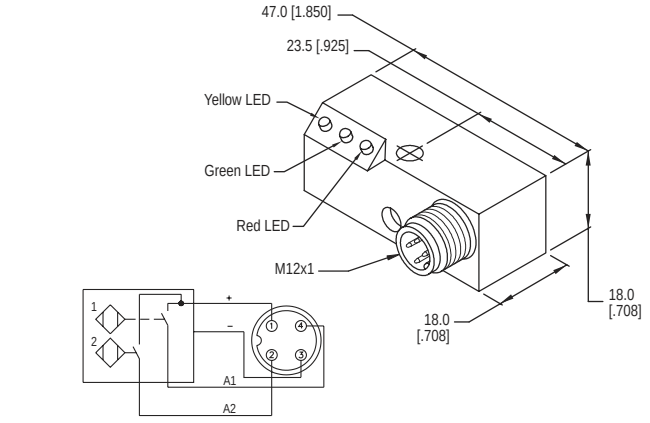
### **PDC** - PEPPERL+FUCHS DC
**NBN2-F581-160S6-E8-V1**



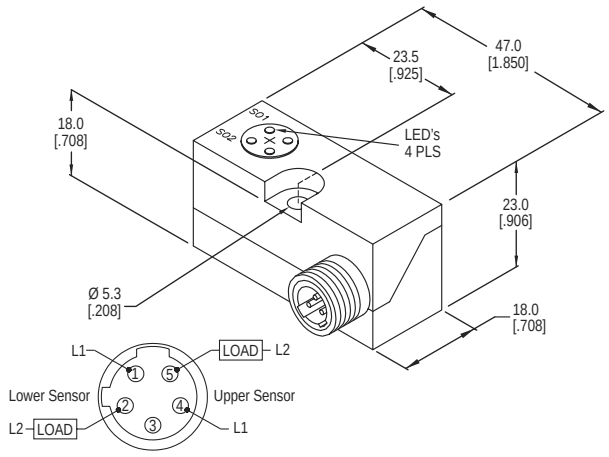

### **ADC** - ALLEN BRADLEY DC
**871D-MW2GP165A-D4**



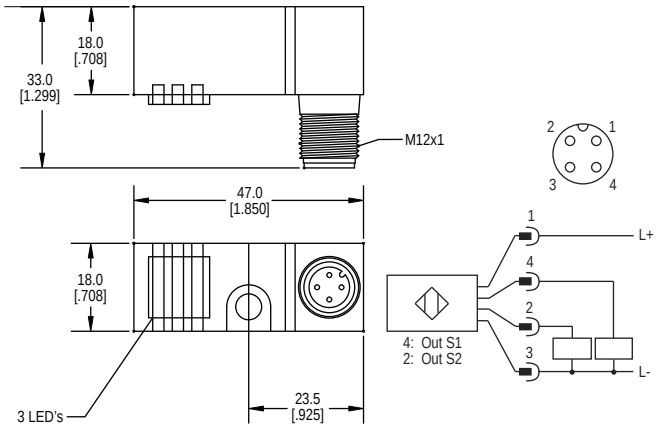

### **TDC** - TURCK DC
**Ni2Q6.5AP6-0.10-FS4.4X3/S304**



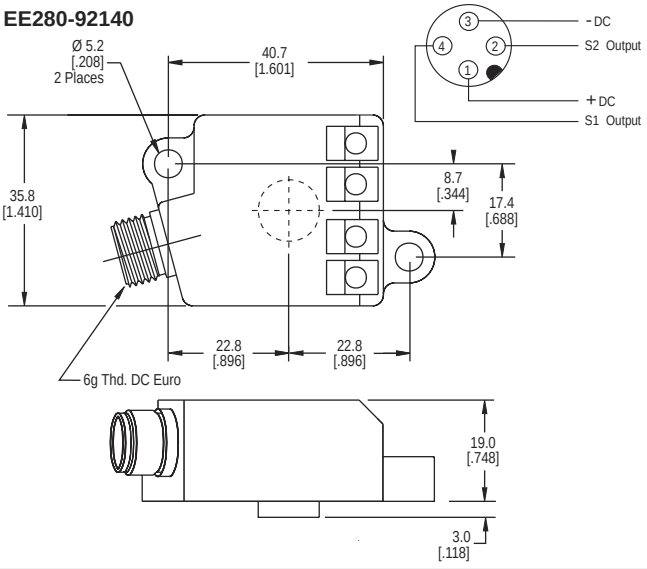

### **TAC** TURCK AC
**Ni2-Q6.5-ADZ32-0.16-FSB5.4X4/S304**




### **EDC -** EFFECTOR DC
**IN5375**




### **NDC** - NAMCO DC
**EE280-92140**



## PREVENTATIVE MAINTENANCE

Keep clamps free of contamination build up. Contamination build up could cause a change of material location or locating performance.

Keep the drain hole in the clamp body free from contamination. This will allow fluid from weld guns to drain out of the upper body cavity. Fluid build up could cause corrosion of the components and lead to clamp failure. The drain hole is located at the bottom of the upper mounting area.

## CYLINDER LUBRICATION

Cylinder seals are self-lubricating and do not require in-line air lubrication. In-line air lubrication can be used, but once used it must not be discontinued.

## SPARE/REPLACEMENT PARTS

### STANDARD CLAMPS

A complete listing of components for all of BTM's standard pin and finger clamps is shown on the following pages. If your clamp is standard, it will have a part number similar to PLC63-N-20.00-P4-PDC, or PLC63-G-25.00-PT-SH-BL-PDC. (See pp 10-11 for more details on identifying part numbers). There will be no special part number designation. Spare parts for standard clamps can be ordered by using the BTM part numbers shown in the tables next to the exploded views.

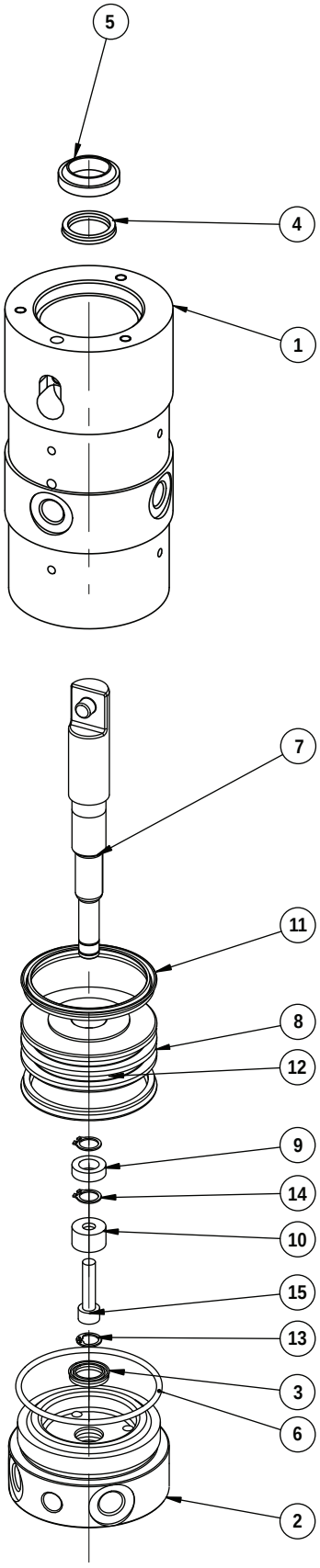
### SPECIAL CLAMPS

To order spare components for a Special BTM pin or finger clamp, you may need to contact BTM to obtain a list of components used in your clamp. If your clamp is special, it will have a part number with either a special assembly number at the beginning or at the end of the part number, such as 7xxxxxx-RSPPDC, PLC63-N-22.25-P4-PDC-PDxxxxxxx, or PLC63-G-25.00-PT-SH-BL-PDC-PDxxxxxxx. (See pp-10-11 for assembly number. Or, you can order the component by referencing the component description along with the special assembly number. For example, you can order:the component by referencing the component description along with the speicial assembly number. For example, you can order: Locating Pin for 7xxxxxx or Locating Pin for PDxxxxxxx.

## PLC63 and SFC63 Cylinder Components

| Det. | Qty | Description | BTM No. | SK |
|---|---|---|---|---|
| 1 | 1 | PLC2-63 - BODY - 3/8 NPT | 756401A | |
| | 1 | PLC2-63 - BODY - G1/4 | PD200001A | |
| 2 | 1 | PLC2/SFC2-63 - END CAP RING - 3/8 NPT | 756403A | |
| | 1 | PLC2/SFC2-63 - END CAP RING - G1/4 | PD200002A | |
| 3 | 1 | PARKER U-CUP PACKING | 018085 | * |
| 4 | 1 | PARKER U-CUP PACKING | 020292 | * |
| 5 | 1 | WIPER RING - .75 ROD. | 020284 | * |
| 6 | 1 | O-RING | 004949 | * |
| 7 | 1 | PLC2 PISTON ROD: CENTERED FINGERS | 756701A | |
| | 1 | PLC2 PISTON ROD: OFF-CENTER FINGERS | 756402A | |
| 8 | 1 | PLC2/SFC2-63 - PISTON | 756404A | |
| 9 | 1 | PLC2/SFC2- FRONT FLAG | 756405A | |
| 10 | 1 | PLC2/SFC2 - REAR FLAG | 756406A | |
| 11 | 2 | 3/16 C/S E4 -U-CUP SEAL -.2.125 | 017657 | * |
| 12 | 1 | SPS FLEX LOC NUT | 001429 | |
| 13 | 1 | INTERNAL RETAINING RING | 013663 | |
| 14 | 2 | EXTERNAL RETAINING RING | 001238 | |
| 15 | 1 | SHCS: M6X1.0 X 25 NYLON PATCH | 019920 | |

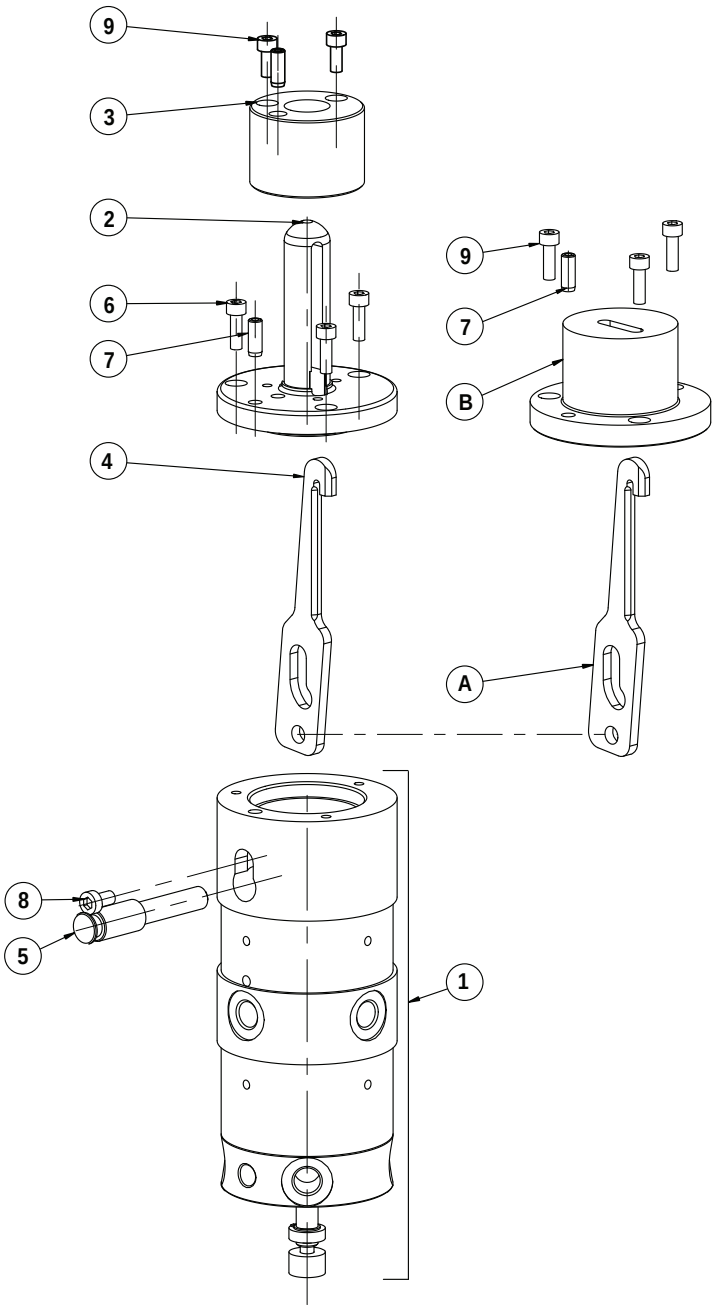
**Seal Kit - BTM No. 024357**
*includes all items marked* ***



## Main Assembly Components:

### PLC63

| | DET. | QTY | DESCRIPTION | BTM No. | Chrome Pin |
|---|---|---|---|---|---|
| MAIN CYL. ASSY | 1 | 1 | 63mm CYL ASSY: 3/8 NPT OFF-CTR | PD200100A | |
| | | 1 | 63mm CYL ASSY: 3/8 NPT ON-CTR | PD200100B | |
| | | 1 | 63mm CYL ASSY: G1/4 OFF-CTR | PD200000A | |
| | | 1 | 63mm CYL ASSY: G1/4 ON-CTR | PD200000B | |
| 20mm PIN DIA. | 2 | 1 | 20.00mm DIA. PIN - 2 WAY | PD200201B | |
| | | 1 | 20.00mm DIA. PIN - 4 WAY | PD200201A | |
| | | 1 | 20.00mm DIA. PIN - TAPERED SH | PD210601A | PD210601ACR |
| | | 1 | 19.80mm DIA. PIN - TAPERED SH | PD210601B | PD210601BCR |
| | 3 | 1 | 20.00mm DONUT | 743706A | |
| | 4 | 1 | 20mm FINGER | 743702A | |
| | | 1 | 20mm FINGER TAPERED | PD210602A | |
| 25mm PIN DIA. | 2 | 1 | 25.00mm DIA. PIN - 2 WAY | 791301B | |
| | | 1 | 25.00mm DIA. PIN - 4 WAY | 777501A | |
| | | 1 | 25.00mm DIA. PIN - TAPERED FL | PD210701A | PD210701ACR |
| | | 1 | 24.80mm DIA. PIN - TAPERED FL | PD210701B | PD210701BCR |
| | | 1 | 25.00mm DIA. PIN - TAPERED SH | PD210702A | PD210702ACR |
| | | 1 | 24.80mm DIA. PIN - TAPERED SH | PD210702B | PD210702BCR |
| | 3 | 1 | 25.00mm DONUT | 777502A | |
| | 4 | 1 | 25mm FINGER | 757203A | |
| 30mm PIN DIA. | 2 | 1 | 30.00mm DIA. PIN - TAPERED FL | PD210801A | PD210801ACR |
| | | 1 | 29.80mm DIA. PIN - TAPERED FL | PD210801B | PD210801BCR |
| | | 1 | 30.00mm DIA. PIN - TAPERED SH | PD210803A | PD210803ACR |
| | | 1 | 29.80mm DIA. PIN - TAPERED SH | PD210802B | PD210802BCR |
| | 3 | 1 | 30.00mm DONUT | 034149 | |
| | 4 | 1 | 30mm FINGER TAPERED | PD210802A | |
| 35mm PIN DIA. | 2 | 1 | 35.00mm DIA. PIN - 2 WAY | 791001A | |
| | | 1 | 35.00mm DIA. PIN - 4 WAY | 773501E | |
| | | 1 | 35.00mm DIA. PIN - TAPERED SH | PD210901A | PD210901ACR |
| | | 1 | 34.80mm DIA. PIN - TAPERED SH | PD210901B | PD210901BCR |
| | 3 | 1 | 35.00mm DONUT | 791201C | |
| | 4 | 1 | 35mm FINGER | 773501C | |
| | | 1 | 35mm FINGER TAPERED | PD210902A | |
| 40mm PIN DIA. | 2 | 1 | 40.00mm DIA. PIN - 2 WAY | PD200801B | |
| | | 1 | 40.00mm DIA. PIN - 4 WAY | 753301B | |
| | | 1 | 40.00mm DIA. PIN - TAPERED FL | PD211001A | PD211001ACR |
| | | 1 | 39.80mm DIA. PIN - TAPERED FL | PD211001B | PD211001BCR |
| | | 1 | 40.00mm DIA. PIN - TAPERED SH | PD211002A | PD211002ACR |
| | | 1 | 39.80mm DIA. PIN - TAPERED SH | PD211002B | PD211002BCR |
| | 3 | 1 | 40.00mm DONUT | 753103A | |
| | 4 | 1 | 40mm FINGER | 753302A | |
| | 5 | 1 | CAM PIN (20-25mm) | 743704A | |
| | | 1 | CAM PIN (35-40mm) | 753303A | |
| | 6 | 3 | SHCS: M5X0.8 X 16 | 015218 | |
| | 7 | 2 | DOWEL: PULL M6 X 16 | 018992 | |
| | 8 | 1 | M6 x 10 LOW HD. SCS. | 018777 | |
| | 9 | 2 or 3 | SHCS: M5X0.8 X 12 | 016045 | |



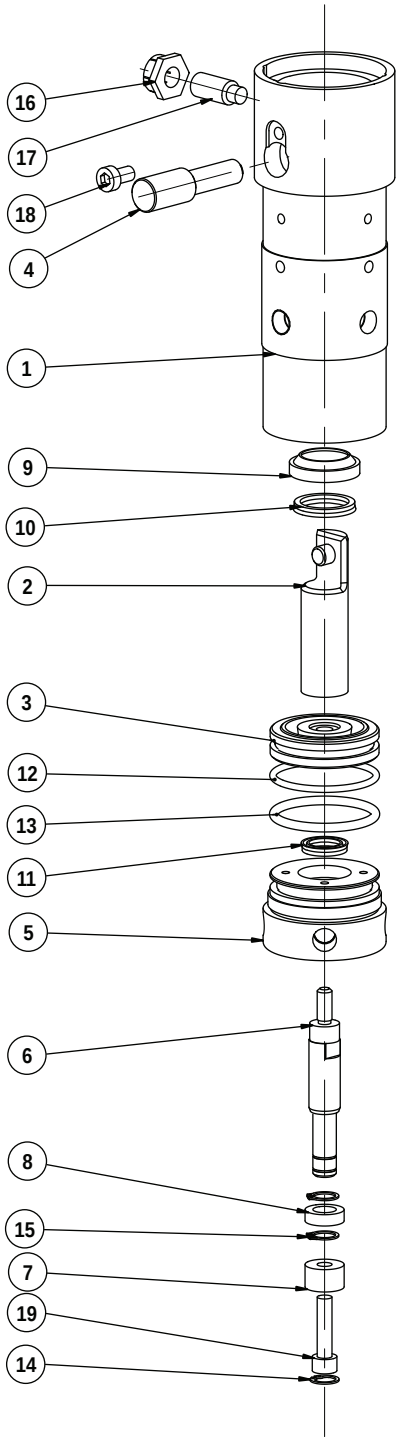

### SFC63

| | | | | |
|---|---|---|---|---|
| Main Cyl. Assy | 1 | 1 | 63mm CYL ASSY: 3/8 NPT OFF-CTR | PD200100A |
| | | 1 | 63mm CYL ASSY: 3/8 NPT ON-CTR | PD200100B |
| | | 1 | 63mm CYL ASSY: G1/4 OFF-CTR | PD200000A |
| | | 1 | 63mm CYL ASSY: G1/4 ON-CTR | PD200000B |
| 29-18mm Hole Range | A | 1 | SFC 29-18mm FINGER | 743702A |
| | B | 1 | SFC 29-18mm - DONUT | 777502B |
| 40-30mm Hole Range | A | 1 | SFC 40-30mm FINGER | 752902A |
| | B | 1 | SFC 40-30mm - DONUT | 791102A |

## PLC45 Cylinder Components

| Det. | Qty | Description | BTM No. | SK |
|---|---|---|---|---|
| **1** | 1 | PLC45: BODY - G1/8 PORT | PD201101S | |
| | 1 | PLC45: BODY - 1/8 NPTF PORT | 791601S | |
| **2** | 1 | PLC45 - PISTON ROD | 791602S | |
| **3** | 1 | PG-45 - PISTON | 728005A | |
| **4** | 1 | PLC45 ~ CAM PIN | 791603S | |
| **5** | 1 | PLC45: END CAP - G1/8 PORT | PD201102S | |
| | 1 | PLC45: END CAP - 1/8 NPTF PORT | 791804A | |
| **6** | 1 | PLC45- EXTENSION SENSING ROD | 791805A | |
| **7** | 1 | PLC2/SFC2 - REAR FLAG | 756406A | |
| **8** | 1 | PLC2/SFC2- FRONT FLAG | 756405A | |
| **9** | 1 | WIPER RING - .75 ROD. | 020284 | * |
| **10** | 1 | PARKER U-CUP PACKING | 020292 | * |
| **11** | 1 | PARKER U-CUP PACKING | 018085 | * |
| **12** | 1 | O-RING | 018774 | * |
| **13** | 1 | O-RING | 000271 | * |
| **14** | 1 | INTERNAL RETAINING RING | 013663 | |
| **15** | 2 | EXTERNAL RETAINING RING | 001238 | |
| **16** | 1 | M10 FLEX-LOC NUT THIN HT. | 018374 | |
| **17** | 1 | M10 x 25 LG. DOG PT. S.S. | 032474 | |
| **18** | 1 | M6 x 10 LOW HD. S.C.S. | 018777 | |
| **19** | 1 | SHCS: M6X1.0 X 25 NYLON PATCH | 019920 | |

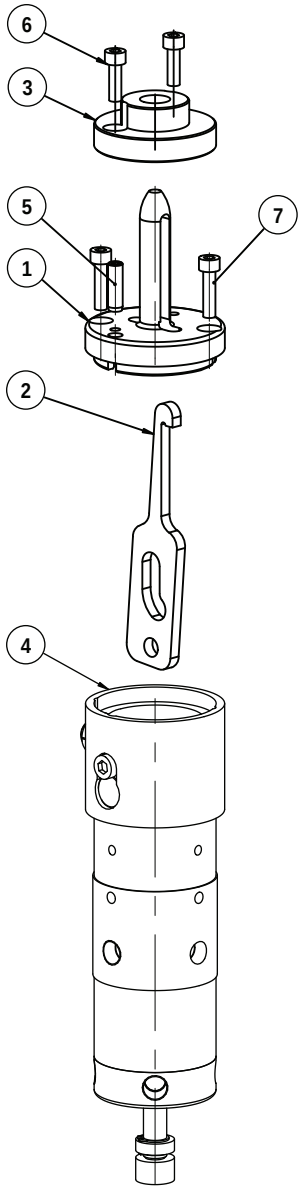
**Seal Kit - BTM No. 740000T**
*includes all items marked* ***



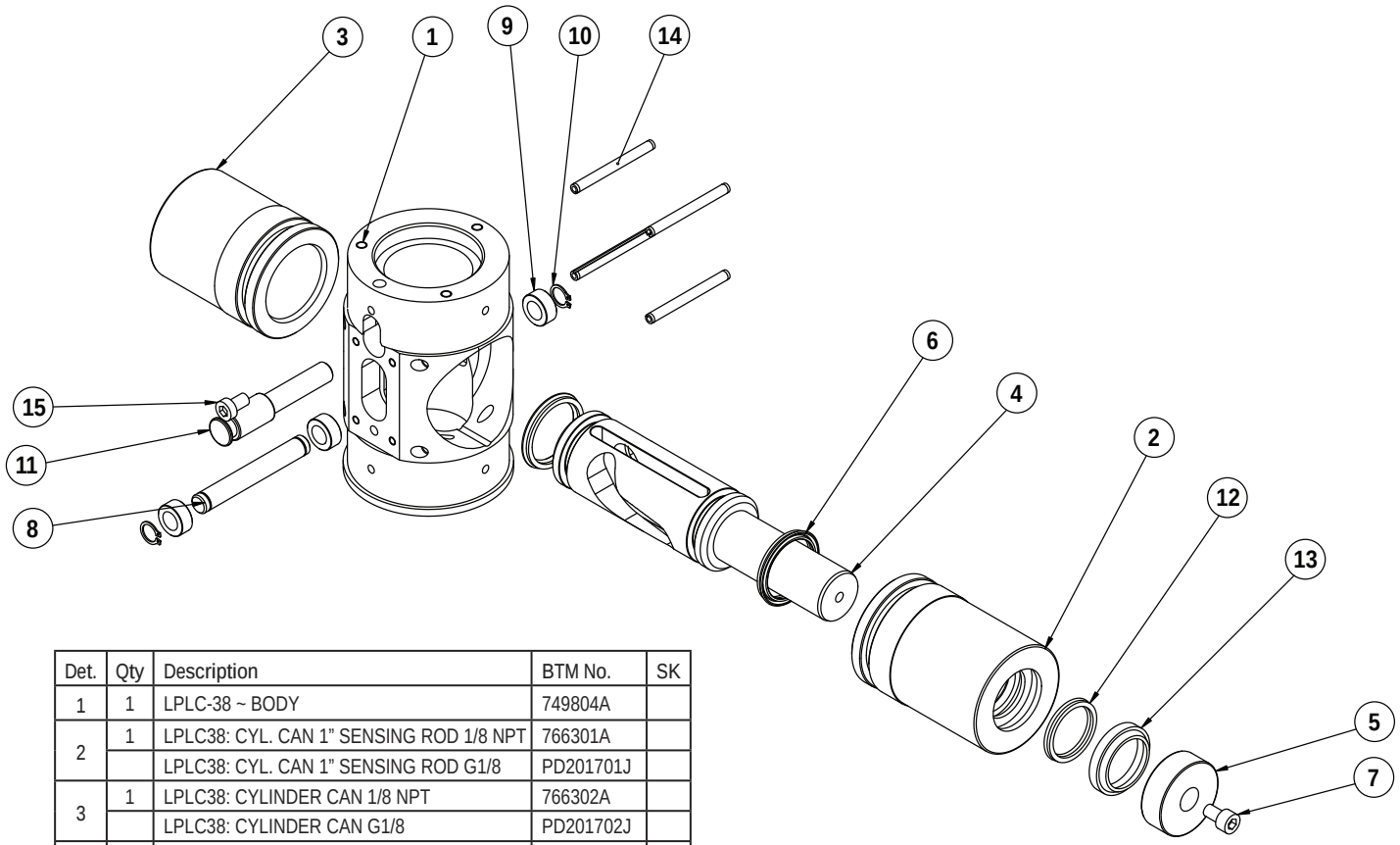
## Main Assembly Components:

### PLC45

| | DET. | QTY | DESCRIPTION | BTM No. | Chrome Pin |
|---|---|---|---|---|---|
| 13mm PIN DIA. | 1 | 1 | 13.00mm DIA.PIN - 2 WAY | 791601D | |
| | | 1 | 13.00mm DIA PIN - 4 WAY | 791601C | |
| | | 1 | 13.00mm DIA. PIN - TAPERED | PD213201A | PD213201ACR |
| | | 1 | 12.80mm DIA. PIN - TAPERED | PD213201B | PD213201BCR |
| | 2 | 1 | FINGER | 791602A | |
| | 3 | 1 | 13.02 mm DONUT | 791602C | |
| 16mm PIN DIA. | 1 | 1 | 16.00mm DIA.PIN - 2 WAY | 791601K | |
| | | 1 | 16.00mm DIA PIN - 4 WAY | 791601J | |
| | | 1 | 16.00mm DIA. PIN - TAPERED | PD213301A | PD213301ACR |
| | | 1 | 15.80mm DIA. PIN - TAPERED | PD213301B | PD213301BCR |
| | 2 | 1 | FINGER | 791602A | |
| | 3 | 1 | 16.02 mm DONUT | 791602J | |
| | 4 | 1 | PLC45: CYLINDER SUB-ASSEMBLY - G1/8 | PD201100S | |
| | | 1 | PLC45: CYLINDER SUB-ASSEMBLY - 1/8 NPT | 791600S | |
| | 5 | 3 | DOWEL: PULL M6 X 20 | 025534 | |
| | 6 | 2 | SHCS: M5X0.8 X 16 | 015218 | |
| | 7 | 1 | SHCS: M5X0.8 X 20 | 016046 | |



## LPLC38 and LSFC38 Cylinder Components



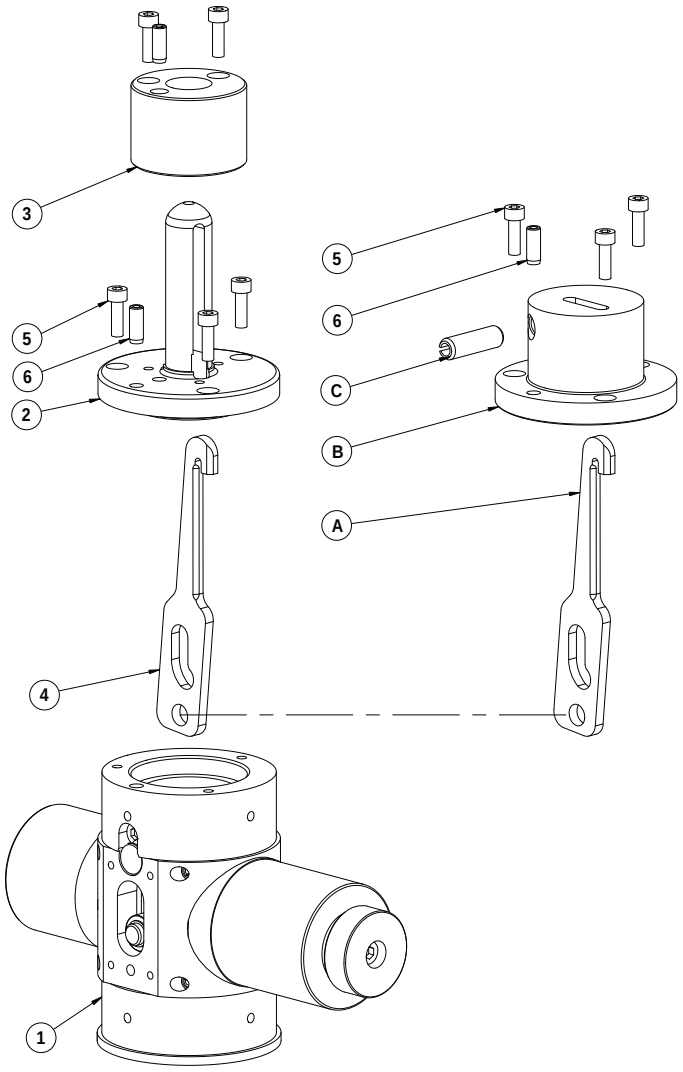

| Det. | Qty | Description | BTM No. | SK |
|---|---|---|---|---|
| 1 | 1 | LPLC-38 ~ BODY | 749804A | |
| 2 | 1 | LPLC38: CYL. CAN 1" SENSING ROD 1/8 NPT | 766301A | |
| | | LPLC38: CYL. CAN 1" SENSING ROD G1/8 | PD201701J | |
| 3 | 1 | LPLC38: CYLINDER CAN 1/8 NPT | 766302A | |
| | | LPLC38: CYLINDER CAN G1/8 | PD201702J | |
| 4 | 1 | LPLC38: PISTON | 766303A | |
| 5 | 1 | LPLC38: UNLOCK ROD | 766305A | |
| 6 | 2 | 5/32 C/S E4 -U-CUP SEAL - 1.187 | 020333 | * |
| 7 | 1 | SHCS: M6X1.0 X 10 NYLON PATCH | 020503 | |
| 8 | 1 | LPLC38: DRIVE PIN - PIN TO ROLLER | 749805A | |
| 9 | 3 | PG38: INNER ROLLER A=.267 | 730204A | |
| 10 | 2 | EXTERNAL RETAINING RING | 001238 | |
| 11 | 1 | LPLC-38 CAM PIN | 749803A | |
| 12 | 1 | PARKER U-CUP PACKING | 018462 | * |
| 13 | 1 | WIPER RING - 1.00 ROD. | 020276 | * |
| 14 | 4 | 3/16 DIA. x 2" LG. ROLL PIN | 013087 | |
| 15 | 1 | M6 x 10 LOW HD. S.C.S. | 018777 | |

**Seal Kit - BTM No. 032303**
*includes all items marked* ***

## Main Assembly Components:

### LPLC38

| | DET. | QTY | DESCRIPTION | BTM No. | Chrome Pin |
|---|---|---|---|---|---|
| MAIN CYL. ASSY | 1 | 1 | LOCKING CYL. SUB-ASS'Y: G1/8 | PD201700J | |
| | | 1 | LOCKING CYL. SUB-ASS'Y: 1/8 NPT | PD201800J | |
| 20mm PIN DIA. | 2 | 1 | 20.00mm DIA. PIN - 2 WAY | PD200201B | |
| | | 1 | 20.00mm DIA. PIN - 4 WAY | PD200201A | |
| | | 1 | 20.00mm DIA. PIN - TAPERED SH | PD210601A | PD210601ACR |
| | | 1 | 19.80mm DIA. PIN - TAPERED SH | PD210601B | PD210601BCR |
| | 3 | 1 | 20.00mm DONUT | 743706A | |
| | 4 | 1 | 20mm FINGER | PD201701A | |
| | | 1 | 20mm FINGER TAPERED | PD211101A | |
| 25mm PIN DIA. | 2 | 1 | 25.00mm DIA. PIN - 2 WAY | 791301B | |
| | | 1 | 25.00mm DIA. PIN - 4 WAY | 777501A | |
| | | 1 | 25.00mm DIA. PIN - TAPERED FL | PD210701A | PD210701ACR |
| | | 1 | 24.80mm DIA. PIN - TAPERED FL | PD210701B | PD210701BCR |
| | | 1 | 25.00mm DIA. PIN - TAPERED SH | PD210702A | PD210702ACR |
| | | 1 | 24.80mm DIA. PIN - TAPERED SH | PD210702B | PD210702BCR |
| | 3 | 1 | 25.00mm DONUT | 777502A | |
| | 4 | 1 | 25mm FINGER | 773401A | |
| 30mm PIN DIA. | 2 | 1 | 30.00mm DIA. PIN - TAPERED FL | PD210801A | PD210801ACR |
| | | 1 | 29.80mm DIA. PIN - TAPERED FL | PD210801B | PD210801BCR |
| | | 1 | 30.00mm DIA. PIN - TAPERED SH | PD210803A | PD210803ACR |
| | | 1 | 29.80mm DIA. PIN - TAPERED SH | PD210802B | PD210802BCR |
| | 3 | 1 | 30.00mm DONUT | 034149 | |
| | 4 | 1 | 30mm FINGER TAPERED | PD211301A | |
| 35mm PIN DIA. | 2 | 1 | 35.00mm DIA. PIN - 2 WAY | 791001A | |
| | | 1 | 35.00mm DIA. PIN - 4 WAY | 773501E | |
| | | 1 | 35.00mm DIA. PIN - TAPERED SH | PD210901A | PD210901ACR |
| | | 1 | 34.80mm DIA. PIN - TAPERED SH | PD210901B | PD210901BCR |
| | 3 | 1 | 35.00mm DONUT | 791201C | |
| | 4 | 1 | 35mm FINGER | 773102C | |
| | | 1 | 35mm FINGER TAPERED | PD211401A | |
| 40mm PIN DIA. | 2 | 1 | 40.00mm DIA. PIN - 2 WAY | PD200801B | |
| | | 1 | 40.00mm DIA. PIN - 4 WAY | 753301B | |
| | | 1 | 40.00mm DIA. PIN - TAPERED FL | PD211001A | PD211001ACR |
| | | 1 | 39.80mm DIA. PIN - TAPERED FL | PD211001B | PD211001BCR |
| | | 1 | 40.00mm DIA. PIN - TAPERED SH | PD211002A | PD211002ACR |
| | | 1 | 39.80mm DIA. PIN - TAPERED SH | PD211002B | PD211002BCR |
| | 3 | 1 | 40.00mm DONUT | 753103A | |
| | 4 | 1 | 40mm FINGER | PD201701G | |
| | 5 | 5 | SHCS: M5X0.8 X 16 | 015218 | |
| | 6 | 2 | DOWEL: PULL M6 X 16 | 018992 | |




### LSFC38

| | | | | |
|---|---|---|---|---|
| Main Cyl. Assy | 1 | 1 | 38mm CYL ASSY: G1/8 NPT | PD201700J |
| | | 1 | 38mm CYL ASSY: 1/8 NPT | PD201800J |
| 29-18mm Hole Range | A | 1 | 29-18mm CLAMP FINGER | PD201701A |
| | B | 1 | 29-18mm - DONUT CAP | PD202401A |
| 40-30mm Hole Range | A | 1 | 40-30mm CLAMP FINGER | PD202402B |
| | B | 1 | 40-30 mm - DONUT CAP | PD202401B |

## CYLINDER SEAL REPLACEMENT

After extended service, it may be necessary to replace the clamp seals. Seal kits are available from BTM (See Cylinder Components breakdown for your specific cylinder). To replace the seals, follow the procedure outlined below.

### 63MM CYLINDER

**Disassembly:** Disassemble the Pin, Rest block (donut), and Finger (Refer to pp 16-18). Remove the rear switch package (Refer to p. 12).

Remove the rear adjustable flag (5mm allen wrench required).

Next, remove the two external retaining rings that retain the front stationary flag and remove flag.

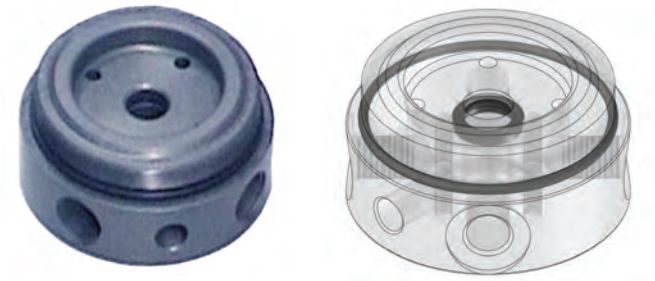
Remove the end cap (Spanner wrench is required).

The piston rod and piston assembly can now be withdrawn from the back of the clamp cylinder. Remove old seals and discard. Clean all components thoroughly.

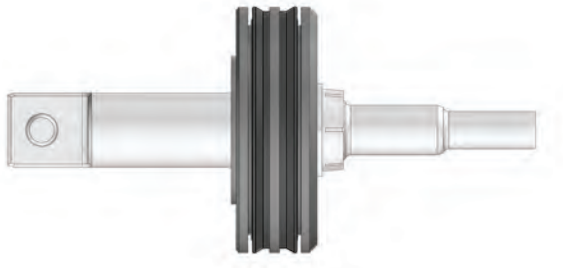
### RE-ASSEMBLY:

The wiper seal is inserted in the clamp body with the lead wiper edge facing the pin end (top) of the clamp body.

The rod seal in the body is inserted in the clamp body with the sealing edge facing the cylinder bore.



The rod seal inserted in the end cap with the sealing edge facing facing the cylinder bore. The end cap o-ring is installed at the base of the threads on the end cap.

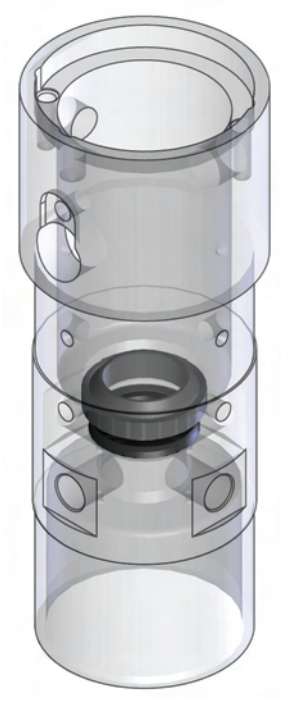


The piston seals are installed with the sealing edges facing away from each other. Grease the piston rod-piston with extreme pressure rated grease (Amoco Rykotac EP or equivalent) and insert it into the cylinder.

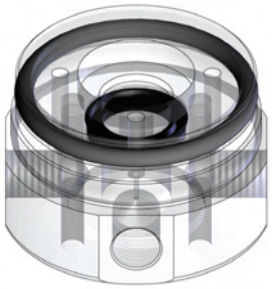
Thread on the end cap and install the front stationary sensing flag and retaining clips. Reinstall the rear adjustable sensing flag and the sqitch package. Reinstall the clamp finger, locating pin, and rest block (donut).

## 45MM CYLINDER

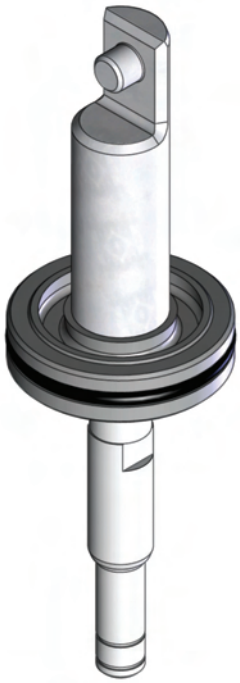
The process for changing the seals in the 45mm cylinder is essentially the same as in the 63mm cylinder. The only difference is that the 45mm piston uses (1) o-ring on the piston.



CYLINDER BODY SEALS



END CAP SEALS

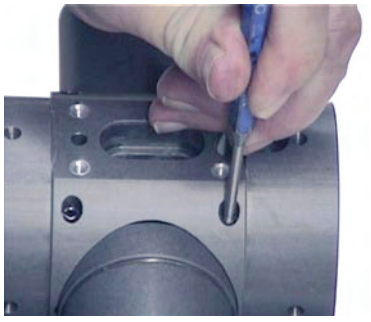


PISTON SEAL

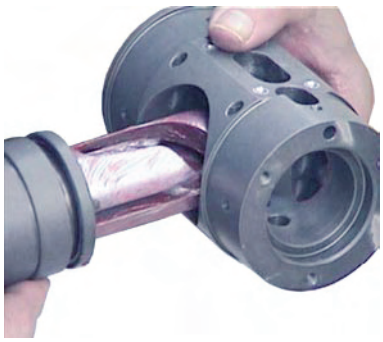
## 38MM LOCKING CYLINDER

**Disassembly:** Disassemble the Pin, Rest block (donut), and Finger (Refer to pp 20-22). Make sure that all of the rollers are removed from the clamp. Remove the switch package and cover plate (Refer to p 20)

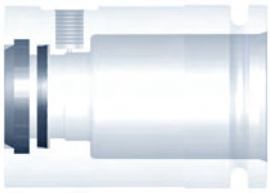
Remove the screw retaining the unlock rod, and remove the rod (5mm allen wrench required).



Push out the (2) roll pins which retain the cylinder can with the open end. (A 3/16 diameter punch is required)



Remove the cylinder can and the piston. Remove old seals and discard. Clean all components thoroughly.



The wiper seal is inserted into the cylinder can with the lead wiper edge facing the small opening of the can. The rod seal in the cylinder can is inserted with the sealing edge facing the large opening of the can.

The piston seals are installed with the sealing edges facing away from each other. Grease the piston rod-piston with extreme pressure rated grease (Amoco Rykotac EP or equivalent).

Insert the piston rod into the cylinder can, and through the seals.

Reinstall the cylinder can and piston assembly. Replace the (2) roll pins which retain the cylinder can. Replace the unlock rod. Assemble the finger, pin, and rest block (donut). Install the switch package.

## Warranty Information:

BTM Corporation warranties its Pin and Finger Clamps against defects in material and workmanship for one (1) million cycles or a period of three (3) years after the ship date from BTM, which ever comes first.

This warranty is limited to replacing or repairing at BTM's option, F.O.B. BTM's factory, any part found by BTM to be defective in materials and/or workmanship. Any application of a BTM product outside the intended use of the product shall not be warranted by BTM Corporation. Furthermore, BTM will not be liable for any expenses incurred for repairs or replacement made outside BTM's facilities without written consent (or damages arising out of such replacements or repairs). Under no circumstances will BTM be held responsible for any consequential damages.

The warranty is limited to the repair or replacement of the defective part(s) and does not include installation.

This warranty is the only warranty extended by the seller in connection with any sale made hereunder and is in lieu of all other warranties, express, implied or statutory including warranties of merchantability and fitness for purpose.

# Potential Failure Mode and Effects Analysis
# Machinery FMEA

## Potential Failure Mode and Effects Analysis
## Machinery FMEA

**Part Number:** 756400A **Customer:** BTM Standards **Prepared By:** Brian Petit
**Part Description:** PLC2 – Pin Locator Clamp **B/P Date/Lev:** 11/8/99 Updated 5/11/01 B **Approved By:** Engineering

| P# | Subsystem Name/Function & Performance Requirements | Potential Failure Mode | Potential Effect(s) of Failure | SEV | ↑ | Potential Cause(s) of Failure | OCC | Current Design & Machinery Controls | DET | RPN | Recommended Corrective Action(s) | Person Responsible Comp. Date | Action(s) Taken | SEV | OCC | DET | RPN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | **BTM Corp.**<br>Pin Locator Clamp<br>300 lbs clamping force at 80 psi.<br>**Function**<br>Positively locate and retain materials into fabrication systems<br>**MCBF**<br>3,000,000 if designed air pressures are maintained | Fracture of clamp finger | Loss of primary function | 8 | | 1a. Clamp subjected to excessive air pressure >90psi<br>**MTTR**<br>15min replace PLC unit | 3 | ES testing with Air pressure maintained at 60-90psi | 4 | 96 | Air pressure regulators maintaining 60-90psi in the plant scheduled maintenance | Local Plant | | | 2 | 2 | 32 |
| | | | | 8 | | 2a. Clamp subject to excessive external load<br>**MTTR**<br>15min replace PLC unit | 3 | Sensing of Prox. Target in opened & close position | 4 | 96 | Review part mass and external interference's | Local Plant | | | 2 | 4 | 64 |
| 2 | **BTM Corp.**<br>Pin Locator Clamp<br>300 lbs clamping force at 80 psi.<br>**Function**<br>Positively locate and retain materials into fabrication systems<br>**MCBF**<br>3,000,000 if designed air pressures are maintained | Reduction or loss of clamp force | Loss of primary function | 8 | | 2a. Loss of air pressure<br>**MTTR**<br>N. A. | 2 | ES testing with Air pressure maintained at 60-90psi | 2 | 32 | No action at this time | | | | | | |
| 3 | **BTM Corp.**<br>Pin Locator Clamp<br>300 lbs clamping force at 80 psi.<br>**Function**<br>Positively locate and retain materials into fabrication systems<br>**MCBF**<br>3,000,000 if designed air pressures are maintained | Loss of locational repeatability to N/C surface | Production quality reduced | 6 | | 3a. Improper torque of mounting screws<br>**MTTR**<br>15min replace PLC unit | 3 | ES testing at torque specifications | 3 | 54 | Torque mounting screws at installation of Pin Locator Clamp | Local Plant | | | 2 | 3 | 36 |
| | | | | 6 | | 3b. Mounting inadvertently hit or moved<br>**MTTR**<br>15min replace PLC mount | 3 | Plant supplies guarding for mount | 2 | 36 | No action at this time | | | | | | |
| 4 | **BTM Corp.**<br>Pin Locator Clamp<br>300 lbs clamping force at 80 psi.<br>**Function**<br>Positively locate and retain materials into fabrication systems<br>**MCBF**<br>3,000,000 if designed air pressures are maintained | Clamp will not cycle | Loss of primary function | 8 | | 4a. Loss of proximity signal<br>**MTTR**<br>15min replace PLC unit | 4 | Cycle tested at assembly | 3 | 96 | Adjust close position sensing target to material thickness | Local plant | | | 2 | 2 | 32 |
| | | | | 8 | | 4b. Contaminated air system<br>**MTTR**<br>N. A. | 3 | Carboxilated Nitrile seals ES testing 20% Electrolytic Iron Powder and 80% zinc metal powder to simulate plant condition w/ water introduced | 3 | 72 | Add air filter in air supply line Plant scheduled maintenance | Local Plant | | | 2 | 2 | 32 |

## Potential Failure Mode and Effects Analysis
## Machinery FMEA

**Part Number: 756400A** **Customer: BTM Standards** **Prepared By: Brian Petit**

**Part Description: PLC2 – Pin Locator Clamp** **B/P Date/Lev: 11/8/99 Updated 5/11/01 B** **Approved By: Engineering**

| P# | Subsystem Name/Function & Performance Requirements | Potential Failure Mode | Potential Effect(s) of Failure | SEV | ↕ | Potential Cause(s) of Failure | OCC | Current Design & Machinery Controls | DET | RPN | Recommended Corrective Action(s) | Person Responsible Comp. Date | Action(s) Taken | SEV | OCC | DET | RPN |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | **BTM Corp.**<br><br>Pin Locator Clamp<br><br>300 lbs clamping force at 80 psi.<br><br>**Function**<br>Positively locate and retain materials into fabrication systems<br><br>**MCBF**<br>3,000,000 if designed air pressures are maintained | Clamp will not cycle | Loss of primary function | 8 | | 4c. Heavy weld slag build up on clamp<br><br>**MTTR**<br>15min replace PLC unit | 4 | Minimal slot clearances & wiper seal<br><br>ES testing 20% Electrolytic Iron Powder and 80% zinc metal powder to simulate plant condition | 3 | 96 | Add weld slag guard | Local Plant | | | 2 | 3 | 48 |
| | | | | 8 | | 4d. Corrosion or water Accumulating in upper finger cavity<br><br>**MTTR**<br>15min replace PLC unit | 5 | Black oxide components, wiper seal & flash chrome piston rod | 4 | 160 | Flash Chrome cam pin & Add drain hole in body cavity | BTM Corp Brian Petit 5/11/01 | Flash chrome added to cam pin detail.<br><br>Ref. EC100159<br><br>Added drain hole in body detail.<br><br>Ref. EC100173 | | 2 | 3 | 48 |

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